# Science and Invention

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Towers that Pierce the Clouds
*See page 216*

The Story of Tornadoes

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| Chevrolet | 41 | Ford (Model A) | 40 | Oldsmobile | 34½ | Reo | 26½ |
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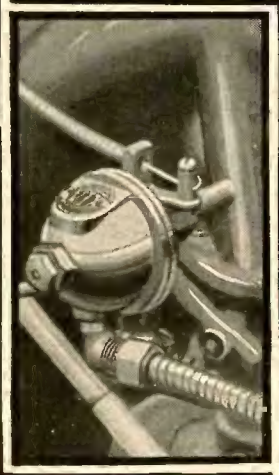

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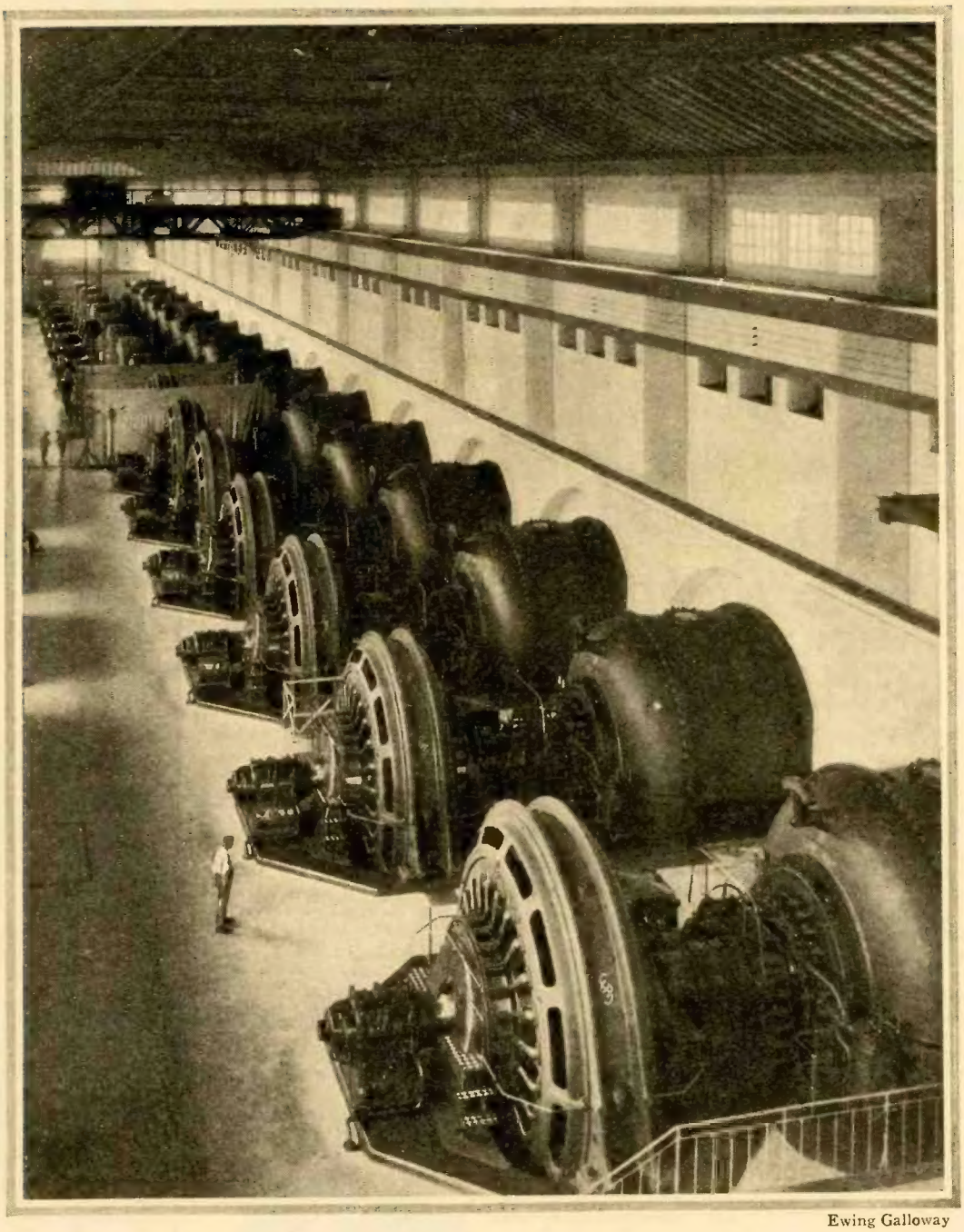

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Some people believe I was lucky. Others think I am brilliant. But this sort of luck I had everyone can have. My type of brilliance is that of any average man.

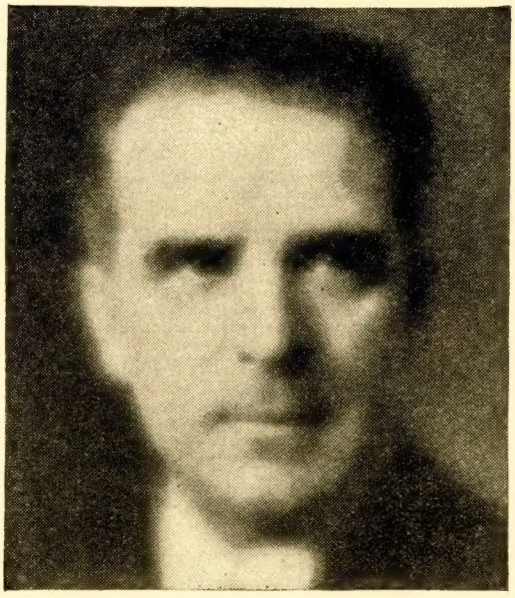
Almost any $40-a-week wage earner has as complete a mental equipment as I had two years ago. And he feels today just about the way I did then. For two years ago, I too, was in the $40-a-week rut. My earnings were $2,080 per year!

I was discontented, unhappy. I was not getting ahead. There didn't seem to be much hope in the future. I wanted to earn more money—a lot more money. I wanted to wear better clothes and have a car, and travel. I wanted to be on a par with people I then looked up to. I wanted to feel equal to them mentally and financially.

But it all seemed hopeless. I was beset with fears. I was afraid of losing my job. I was afraid of the future. I could see nothing ahead for myself and my wife and baby but a hard struggle. I would live and work and die—just one of the millions who slaved their lives away. I was irritable, easily annoyed, discouraged, "sore" at my fate and at the world. I could not think clearly. My mind was in a constant whirl. I was "scatterbrained." I had a thousand half-baked ideas to make more money, but acted on none of them.

The end of each year found me in about the same position as the beginning. The tiny increases in salary, grudgingly given to me, were just about enough to meet the rising costs of living. Rent was higher; clothes cost more; food was more expensive. It was necessary for me to earn more money. So once in a while I got a few dollars more. But it wasn't because of any great change in my ability.

Today I have an income of $20,000 a year. That's exactly $17,920 more than it was two years ago. A difference of $35,840 in two years. My family has everything it needs for its comfort and pleasure. My bank account is growing rapidly. I have my own home in the suburbs. I am respected by my neighbors, and I have won my wife and children's love as only the comforts and pleasures of life can do.



When I am old I will not be a millstone around anyone's neck. My children will not have to support me.

I look forward to the future with confidence and without fear. I know that only improvement can come with the years. Once I wandered through life aimlessly, cringing, afraid. Today I have a definite goal and the *will* to reach it. I know I cannot be beaten. Once my discontent resulted in wishes. Today my slightest discontent results in action. Once I looked forward hopefully to a $5 a week increase in salary. Today I look forward confidently to a $100 a week increase in my earnings.

What magic was it that caused the change in my circumstances? How did I, a $40-a-week clerk, change my whole life so remarkably? I can give you the answer in one word—Pelmanism. I gambled 2c on it. Yet without it, I might have continued in my old $40-a-week rut for the rest of my life.

Pelmanism taught me how to think straight and true. It crystallized my scattered ideas. It focused my aim on one thing. It gave me the will power to carry out my ideas. It dispelled my fears. It improved my memory. It taught me how to concentrate — how to observe keenly. Initiative, resourcefulness, organizing ability, forcefulness were a natural result. I stopped putting things off. Inertia disappeared. Mind-wandering and indecision were things of the past. With new allies on my side and old enemies beaten, there was nothing to hold me back.

I am writing this in appreciation of what Pelmanism did for me. I want other average men to gamble 2c as I did. For the cost of a postage stamp I sent for the booklet about Pelmanism, called "Scientific Mind Training." Reading that free book started me on my climb. I took no risk when I enrolled for the Course because of the Institute's guarantee. All I gambled was 2c and I am $36,000 better off now than I would have been had I not written for the book about Pelmanism.

* * * * *

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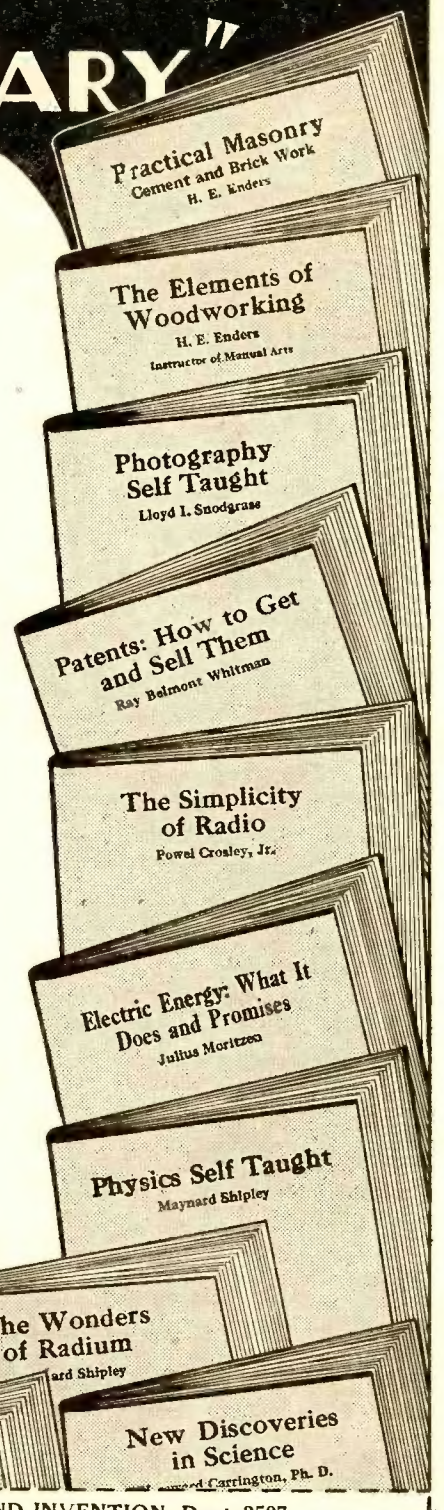


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JULY, 1930
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VOLUME XVIII
WHOLE NO. 207

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# TELEVISION

TWO years ago we were led to believe that we would soon be able to witness the World's Series in our living rooms and hear the crack of the ball against Babe Ruth's bat as he snapped out a homer. In fact, we read such glowing accounts by so many important radio people that television seemed to be a foregone conclusion. Then we began to see some television transmissions. The image instead of being large enough to fill up one side of our room was approximately one and a half inches square. The delightful pictures that we were supposed to see were confined to the head and shoulders of some well-trained actress, particularly well painted up so that the powerful lights reflected on her face would be able to give some sort of definition over the radio pick-up and reproducing devices.

When the reproduction appeared on a small metallic plate in front of a neon gas tube there was very little delineation and the image usually danced about on a small plate and appeared much like the head of a mummy from an old Egyptian tomb. The image was spotted and pitted and well streaked.

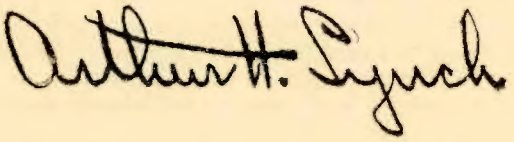
Many of the radio magazines and scientific papers took all of the publicity articles on this subject and in many instances an entirely erroneous picture of this new art was presented. Special books on television were worked up in a hurry. Catch-penny manufacturers developed all kinds of gimcracks, which were supposed to operate as television receivers, when used in conjunction with the simplest of receiving equipment. Many of these manufacturers coined small fortunes selling this junk. As a result, television was given a very black eye and to the man in the street it has apparently lain dormant ever since.

When these woebegone exhibitions were held, we prayed very enthusiastically that no one would go and see them, but hundreds of people did and now we are well satisfied that our prayers went unanswered. Anyone who saw these early exhibitions, and who can witness the advance that has been made in the past two years, will realize that television does offer all kinds of possibilities, even if it was so badly presented then. In fact, practical television is not just around the corner. It is here now.

This does not mean that all of the wild claims made for it some time ago have been substantiated, nor does it mean that the picture we are likely to get with a home televisor is going to be particularly large. It does mean, however, that the method of transmitting and the method of receiving have been greatly improved. For the time being most of us will have to be satisfied with television receivers, because the number of transmitting stations must be very limited on account of the frequency bands they must cover, and must be very expensive because of the delicacy of the equipment. Our receivers, however, need not be particularly complicated nor very expensive. In fact, some television receivers are now available at comparatively low prices, and many television units suitable for operation in conjunction with existing short wave receivers and capable of producing fairly satisfactory results are available.

In our opinion, the thousands of radio enthusiasts, who built their own receivers and learned much of radio as a consequence and have become tired of their hobby because there is nothing apparently new in it, will find in television a field for experimentation which combines almost all of the present applied sciences. Much of the transmission is being done by the photographic film process. There is the probability of applying to television all of the knowledge which has been gained by engineers in the development of the talking motion picture. The study of acoustics becomes an important part of this new business and a working knowledge of physics, chemistry, electricity and optics can be used to extremely good advantage.

Practical television offers a highly interesting experimental field. But let us be sensible about it.



*"Those Who Refuse to Go Beyond Fact Rarely Get as Far as Fact"* - - - - - *HUXLEY*



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A result of this research was the introduction of high-compression cars in 1927. In that year only about 14 per cent of the new car models were high compression (5 to 1 ratio or better) but in 1928 the proportion had grown to 56 per cent. In 1929 it was 77 per cent and this year approximately 84 per cent of the new models are of this type.

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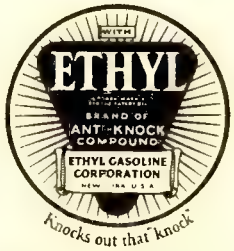


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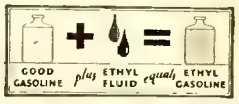


*The active ingredient used in Ethyl fluid is lead.*

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# ETHYL GASOLINE

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SCIENCE *and* INVENTION

*Volume XVIII. Number 3*

JULY 1930

# Master *of the* "Whirlwind"

## *Lawrance, Builder of the Famous Radial Motor Used by Byrd and Lindbergh, Is Against the Diesel and Calls the Turbine the Final Engine Form*

By Alfred M. Caddell

HE did not have to roll up his sleeves and concern himself with gasoline engines and such like, for his father was a banker. But he was born with a mechanical bent and he has indeed put his talents to good practical use.

Who hasn't heard of Charles Lanier Lawrance, designer and builder of the Wright Whirlwind motor, which carried Lindbergh to Paris, Chamberlin to Germany, Byrd across the North and South Poles, the army fliers to Hawaii; which has hung up distance and endurance records and propelled innumerable craft millions upon millions of miles?

The boy was sent to school with the fond parental hope that he, too, would become a banker. But at eleven he was already far enough along in engineering to design complete plans for a submarine, and while at school he started building an automobile which he completed during his freshman year at Yale. The car was a great success. It had a four-cylinder motor, a standard gear shift and a worm and sector steering gear. Then he and two of his friends began making a car to compete in the Vanderbilt cup races.

*Charles Lanier Lawrance, a banker's son, who made his entry into the aero field with an improved wing which was used by both England and Germany in the war. But motors were what he loved most, and his success in designing these became a national triumph when one of his Whirlwinds carried Lindbergh from New York to Paris.*

The car was completed the day before the races, but on a trial spin blew out a cylinder head which forced it out of the running. Subsequently, however, this car won many prizes, attaining a speed of ninety miles per hour—not a slow pace for those days. The youthful engineers built twenty of these cars and were on the high road to success when the panic of 1907 overwhelmed them with business troubles and forced them to close up shop.

For a while Lawrance studied architecture, but his old love for motors proved too magnetic and he was soon back at the designing board and in the machine shop.

On one occasion he drove an old rattletrap down to meet the boat on which his father and J. P. Morgan were returning. Morgan chided Lawrance's father about the boy's "limousine," which chiding had the effect of the parent offering to buy the boy a new car. "Give me the $4,000 instead and I'll build myself a new one," he said. But $4.000 was only half enough, so much experimenting and engineering did he build into his masterpiece.

Good designer and motor expert though he was, Lawrance had a hard time finding himself. His ups and downs were very much like those of any other young man.

Eventually, the war came and Lawrance joined the Navy, and it was not long before he had obtained permission to experiment with the radial, air-cooled design which up to that time had been strictly a motor on paper. In the face of discouraging views of many of his friends he set himself the task of developing a three-cylinder, air-cooled radial engine. Now (*Continued on page 262*)



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Ewing Galloway

**Fairbanks**

*This view of the Government Agricultural Station at Fairbanks is typical of the country around the northern terminal of the great highway. . . . To the right is the radio operator of the pathfinding party, B. E. Sandham, who has kept daily contact with Los Angeles headquarters during the expedition into Mexico.*

Auto Club of Southern California

**Los Angeles**

*Here is the home of the Automobile Club of Southern California, Los Angeles, one of the chief promoters of the intercontinental motorway.*



Auto Club of Southern California

# *A* Cord *of* Concrete *Will Bind the Americas Together*

By Ernest McGaffey

AT last the two Americas are to be linked by land as well as sea. A smooth, white motorway, running from Fairbanks, Alaska, down through Vancouver, Seattle, San Francisco, Los Angeles, Mexico City, San Salvador, Bogota, Lima and Santiago, and then across the Andes to Buenos Aires, Argentina, will give John Citizen and his Spanish-American counterpart the chance to sightsee in their own motor cars from the Aurora Borealis to the Southern Cross. As for the commercial possibilities, they quite outrun the imagination of the observer at this time.

A considerable part of the long road through North America, Central America and South America is already existent. Efforts are being made to chart and map the remainder and to blaze a

(*Cont'd on page 263*)

*Señorita Lupe Guizar of Guadalajara pointed out southern highway routes to the members of the pathfinding party before the start of the trip.*

Auto Club of Southern California



Ewing Galloway

**Buenos Aires**

*Congress Plaza, Buenos Aires, strikingly illustrates the spacious and ornate character of the vistas of the highway's southern terminus.*

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# Aloft *with the* Bouncing Blimps

By William Watts Chaplin
*Former Staff Reporter with the Associated Press*

***This is the third of a series of dramatic close-ups by William Watts Chaplin. The first—Eyes Across the Sea—was published in May; the second—the Sky Talkers—in June. The fourth will be a thrilling story about the dirigible Los Angeles, entitled The Temperamental Old Lady of the Skies.***

THERE are many people who will tell you that dirigibles are all right for long-distance freight and also passenger service, say from California to Hawaii or even Japan; but that they are too slow and vulnerable for use in war. They should have sat with me above a man-made cloud of smoke and seen an ocean liner, which might just as well have been a man-of-war, vanish to helplessness against potential destruction by the safely concealed gunboats of the sky.

And there are just as many who will say that dirigibles may be well enough as the eyes of the fleet but that they have no place in commerce. They should have ridden down the bay with me and seen the landing of the TC-10 on a little twenty-foot moving platform. They could easily visualize regular shore to ship service by large dirigibles which could cut the ocean journey for fast freight and passengers to no more than three days.

*Above, the TC-10 appears about to land on the steamship for an exchange of mail and passengers. Left—A plane spreading a smoke screen above an airplane carrier. Right—Planes "bury" a theoretical enemy ship under a screen of smoke.*

Photos by Associated Press

One assignment was to witness the landing of the TC-10 on the deck of a regular ocean liner under steam, for exchange of mail and passengers, and the other was to take part in a smoke screen maneuver at sea in which the TC-10 and her sister non-rigid dirigible the TC-5 participated, in company with an Army plane and a United States Lines steamship bound for Europe. Both took place a short distance outside Ambrose Light at the entrance to New York harbor.

For the first, I boarded the steamer at its pier and on the way down the bay had ample opportunity to examine the miniature landing field constructed on the poop deck for the occasion. It was a heavy steel frame with a plank flooring twenty feet square, about ten feet above the deck and three of its unrailed sides directly overlooking the water some forty feet below. A score of soldiers from Governors' Island were along as landing crew and as I looked at that sheer drop to the white-churned water I felt scant envy for them.

Just after we dropped the pilot there came into view on the horizon a glinting speck which rapidly increased in size as it approached until it revealed itself to the excited passengers crowding the steamer's rail as the Army dirigible. Outside Ambrose Light the liner cut its speed to half-steam ahead and the TC-10 circled above like a bird selecting a landing place.

Army lighter-than-air flyers had in the past landed these ships on the top of a building and on the surface of the water, in earlier tests of their maneuverability, but this was the first time it had been attempted on a moving base and one so small in size, and there was considerable nervous expectancy about the result.

The soldiers were ordered up the ladder to the landing floor, and be it said to their credit that not one hesitated although they must have known that they stood an excellent chance of being pushed into a high dive to the waves below. The TC-10 was brought directly above the platform, about twenty feet up and running at the same speed as the steamer. Then the landing ropes were released and fell among the soldiers waiting with upraised hands.

Everyone on that ship must have held his breath at that moment, visualizing a possible lurch of the airship which would sweep the soldiers into the sea or carry them aloft. Days later I saw the Navy Los Angeles careen into the air with members of the ground crew swinging helpless underneath.

But the Army flyers brought their ship down, with the soldiers tugging at the ropes, so that the underhanging gondola of the blimp settled exactly on the platform, the gas bag extending far out beyond the end of the liner and alongship almost to the passengers on the boat deck. A man scrambled out of the dirigible's gondola, another who had come down the bay on the liner scrambled in, a bag of mail was dropped on the deck, and then came the sharp command "Up ship."

The ropes were released. The TC-10 lifted gently in the air. Her two engines roared, and away she went, swaggering across the clouds with her new victory.

Was the experiment worth while? Was it more than a mere stunt? The full answer of course can only be given by the future. But that day's work certainly served to demonstrate the feasibility (*Continued on page* 264)

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# Will *the* Insects

## *The Ferocity of Their Warfare with Each tiplying Ability, Shows Why They Will Be Dr. E. Bade Tells How They Survive by the Commodities on Which*

*The digger wasp does not hesitate to engage and carry away a cicada.*

ONE of the outstanding purposes of insect life at all stages is to eat and to be eaten. Abusing and devouring each other with almost incredible ferocity, insects destroy with an energy no less appalling incredible quantities of the foodstuffs, clothing and building materials, and other commodities on which the existence of human life depends.

Human beings, for the most part, have passed beyond the necessity of sacrificing everything, including life itself, in the interest of the human groups to which they belong. Not so the insects. Their instinct for the increase and maintenance of their kind extends to the maddest extremes, while their care for the individual amounts to practically nothing.

In their frenzied search for nourishment, insects of various types have adapted themselves to foods which other species could not possibly digest or utilize. No organic substance is spared. Dead wood, hairs, cloth, feathers, the horns and hoofs of animals, and even metal disappear in vast quantities into the insect maw.

In the light of such considerations it is probably no more than the truth to say that the insects are the coming masters of the world. In our own country it is certain that their advance steadily proceeds, despite all that experts can do to check them. They have all the qualifications for conquest.

Historically the insects precede the mammals. In the carboniferous age, when our coal deposits were in process of formation, the insects were engaged in making themselves at home. Darning needles and grasshoppers thrived. Termites bored their way into the stems of giant plants. Today they have multiplied until they form a gigantic portion of the life on this planet, and the increase of industry and agriculture has constantly furnished them with new and better opportunities to survive.

*Like a tiny tank the ladybird moves along devouring aphides.*

Although insects are small in size, their capacity for reproduction is staggering, and their capacity for work is superior to that of any other living thing. With such energy do the termites operate that they are able to destroy entire villages. Grasshoppers make away with the crops of whole regions, leaving nothing for man to harvest. When the tropical ants invade a territory, men must go, leaving their land to the insects.

The complete victory of plant-eating insects over man is delayed, not by human science, but by the cannibalism and parasitism of other insects. Some of the latter are assassins, who hurl themselves on their prey and destroy it. Others deposit their eggs on the bodies of the plant eaters or on their eggs, or introduce them into the larvæ. The parasitic larvæ then flourish on the body of the living host. Parasitic larvæ ordinarily have long digestive organs which are closed at one end and which serve as food reservoirs, and they digest the contents as needed. They eat the fat, blood, and lymph of the host, leaving the outer skin, breathing organs, and trachea undestroyed. The digestive organs of the host are eaten just before the pupal stage begins.

*Several species of wasps saw holes in trees and insert their eggs. This one is sawing a hole in solid hickory.*

Parasites living within other insects have no breathing organs, but breathe directly through their skin, abstracting the necessary oxygen from the blood of the host. The trachea of the parasitic larvæ does not open exteriorly until the host has been discarded.

Other insects like the robber wasps are more cunning in their attack on their fellows. They paralyze their victim by inserting the poison sting, with which they are provided, into the abdominal ganglion. This ganglion, which covers only a very small space, is found by the majority of these insects with certainty. This main nerve center is reached by these wasps even on the well-armored beetles, and when the center is once punctured the victim is motionless, although it remains alive. In this condition the victim is brought into the robber's nest, where it is provided with an egg.

*Insects are even more ruthless than men in combat. Here one species of beetle is in hot pursuit of a smaller variety.*

Quite a number of the parasitic insects show weird peculiarities. Occasionally it may happen that an egg deposited within a host egg by a small parasitic wasp begins at once to divide. This will not kill the egg of the host. In fact, it begins to develop in the normal way. At the same time the smaller eggs, which are produced by the division, begin

*In "hand-to-hand" encounter this robber fly slays a rose beetle.*

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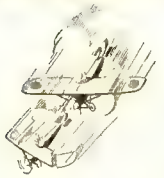
# Conquer Man?

***Other, No Less Than Their Immense Mul- Masters of the World. . . . In This Article Devouring Impartially Their Own Kind and Human Life Depends.***

By Dr. E. Bade



*Remindful of the autogiro is this darning needle, taking flight with an insect it has slain.*

their development, and in this way as many as 200 and even more parasites come from a single egg. But all of these have only one sex. They are either all male or all female.

It even happens, as is the case with certain gall flies, that the larvæ are able to reproduce, developing within the mother's body and then devouring it. The young, on emerging, fall a victim to the same fate. Later in the season the full, mature generation is developed, which multiplies in the normal way.

It is primarily the parasites which destroy an enormous number of injurious insects. As soon as any particular type of insect is found scattered about in large numbers, especially after a year or two when their great number produces vital damage to many plants, it can usually be taken for granted that in a few years, usually two or three, almost all of that particular type of pest will have disappeared. This fact is caused by the parasites of this species. Under normal conditions no particular insect will be found in greatly exaggerated numbers, but if this is the case, the cause can be found in the unfavorable climatic conditions which tend to destroy the parasites. The following years, if conditions change, the parasites again multiply normally. One or two years will have to elapse before sufficient parasites have been produced to check the ravages of the pest. Then the parasites, of which there is now an excess, do not find sufficient hosts to multipy themselves, therefore they also decline and decline more rapidly than the pest, so that in a few years there will again be an excess of pests. Under present agricultural developments, however, many insects which attack plants are brought to climates where their natural parasites do not thrive, and thus their increase is unchecked.

*When a fly falls foul of a tiger beetle, it's death and destruction for the less savage fly.*

Although a big hole is made in the insect pests by the parasitic and assassin insects, still others are able to make good the loss by a peculiar method of reproduction whereby the services of the male insect are dispensed with, the female depositing her eggs and these developing by the so-called parthenogenetic method. This is done by the plant lice, an insect where the males are few during the greater part of the growing season. The female lays her eggs, and the young developed during the summer are also females which also lay their eggs. In the fall the males make their appearance. A similar method of reproduction is found in certain injurious sawflies. But here certain of the eggs do not develop. Others do grow and the larvae produced live only a short time. Still others reach maturity, but the sex produced is always male.

Parasitic insects and robber insects are far more useful than the chemical sprays which man employs. The chemicals are a two-edged sword, for they not only destroy the harmful insects but the useful ones. But man cannot depend on his insect friends alone. He must employ the poisonous sprays to hold the ever-increasing horde of pests at bay.

*The robber fly in its favorite rôle of killing—to devour.*

Or perhaps the expression "at bay" is wrongly applied. For available data indicates that man generally is falling back before the insect advance.

One of several cases of the retreat of man before the insect is shown in the combat with the Japanese beetle. This bright-colored arrival on our shores was first noted in 1916. Inspectors of the New Jersey department of agriculture discovered several specimens in a nursery near Philadelphia.

The infested area in 1916 comprised only half a square mile of territory. C. H. Hadley of the Federal department of agriculture had eight states cooperating with him in the campaign against the beetle. Yet after thirteen years of conflict Mr. Hadley said, "We acknowledge neither victory nor defeat. This we admit, however: The Japanese beetle can never be exterminated. It is going to spread from one end of the country to the other. Our quarantine and control measures are being maintained with one purpose, the restriction of the beetle to its natural rate of distribution, which is from 15 to 21 miles annually. At that rate it will be 35 to 40 years before it reaches the Middle West, and perhaps a century before it touches the Pacific Coast. This delay means so many more millions in our pockets."

Obviously there is no question here of holding the insect at bay or conquering it. A slow retreat is the best that experts hope for, and plenty of effort must be expended even to achieve this negative result!

*A high development of insect warfare —the smaller beetle is protecting its retreat with a cloud of noxious gas which is manufactured within its own system for this purpose.*

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# Safe Thrills *for a* Great Talkie

## *Harold Lloyd Employs Ingenious Technical Tricks to Enliven His Comedy, "Welcome Danger"*

By Edwin Schallert

*Fig. 1*
*The movements of a turtle are controlled by two men out of camera range. Each holds a string fastened to the turtle.*

*Fig. 6—When a flower pot drops on the policeman's head, the noise is produced by a cracking of the papier-maché pot as the sawdust contents spill over the actor.*

HAROLD LLOYD always has a host of new gags up his sleeve for whatever picture he makes, and invariably he calls upon the trick photographer and technical man to help him out. "Welcome Danger" is no exception.

This picture shows Lloyd as an amateur sleuth bent on discovering the whereabouts of a kidnaped Chinese doctor, and the capture of the ringleader of an illicit opium trade. In this weird and exciting comedy thriller, the comedian encounters all manner of fantastic adventures and direful perils, climaxed when he fights off a score or more of adversaries with a policeman's billie club, and has a hand-to-hand combat with a big burly negro.

The thrill scenes of the picture reveal Lloyd and Police Officer Clancy invading a Chinese den at night, where things happen fast and furiously. Corpses of dead Celestials rise up and threaten, a lighted candle that they set down begins to walk away, a dragon of ferocious aspect leaps out at them from behind a closet door. Then, biff, bang! The two men are in a fight with a throng of tong men, during which everybody gets clouted over the head with sticks and clubs.



*Fibre wood clubs are used to produce the resounding crack. They injure no one.*

The "dead" Chinese are in reality wax dummies. One is raised slowly into a sitting posture when an actor pushes up a trap door beneath the corpse's head.

*Fig. 2*
*Cardboard blades were substituted for metal in a slow-moving fan so as not to injure the cat.*

*Fig. 3*
*The leaping dragon emerges with terrific force. The energy was developed by a catapult. See Fig. 4.*

Later on this same dummy, in a standing posture is pushed over against Harold so that its weight rests on his shoulder. He thinks it is his companion, Clancy "standing by," until he looks around. Then he goes into a panic of fear, wrestles with the "dead" Chinese, and finally emerges from the struggle with a knife in his hand, while Clancy looks at him aghast, and says, "Too bad you had to do it, Chief," inferring that he had killed the Chinaman.

The moving candle is explained in Figure 1. When they set the candle down Harold and Clancy do not notice that they put it on a turtle's back. The candle moves away, and later returns and the flame brushes by both Harold and Clancy, seated on a box, and singes the seats of their trousers. How the turtle was made to become a movie actor is disclosed in the diagram. The turtle's movements were regulated by two strings clamped to the outer edge of the shell, pulled by assistants beyond camera range. Harold and Clancy used asbestos padding in their trousers in this scene.

Contributing to the fright of Lloyd are the squeals of a cat whose tail gets caught in an electric fan (Fig. 2). In order to avoid unpleasantness for the cat, cardboard blades were substituted for the metal ones in the rather slowly turning propeller.

In a pitch-dark room, Lloyd thinks he has found a way out of the Chinese den. He starts mounting what he believes is a stairway. He reaches the top and asks Clancy to light a

(*Continued on page* 283)

*Fig. 4*
*Behind the scenes with the catapult which drove the dragon out to the terror of Harold and the amusement of the audience.*

*Fig. 5*
*The lights went out as the ladder fell, but Harold Lloyd was not injured. As the illustration shows, he was supported with a pair of shoulder straps, attached to a beam above.*

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# Funnels *of* Terror

By B. Francis Dashiell

***The Tornado, King of the Winds, Is a Growing Menace to America, but Withal, the Number of Actual Tornadoes Is Not Increasing***

*A rare and striking photograph of a tornado. The funnel formation is plainly demonstrated, and the destructive disturbance on the ground may be surmised.*

THE tornado is a local wind-storm of great violence, a spectacular and frightful thing. The tornado, or "twister," is an elongated funnel-shaped cloud tapering down to a small diameter at its lower tip. Into this slender tip is concentrated the greatest destructive fury of nature. Even the energy of the West Indian hurricane or the Far Eastern typhoon is mild compared with the irresistible and destructive nature of the tornado!

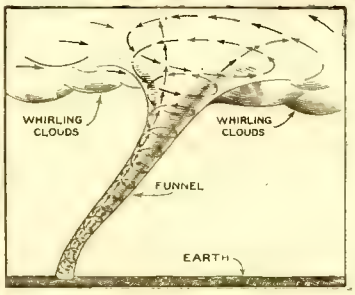
A tornado is quickly born and after traveling a short distance dies. It is the child of the cyclone—that general spell of stormy weather which spreads far across the country at times. Within this cyclone storm area there is a region of ominous clouds, local thunderstorms, squalls and torrential rains. Amid the black and tumbling clouds of the passing storm, and to the accompaniment of vivid lightning, the roll of thunder, and the roar of approaching winds, the tornado is born.

*Below — After the St. Louis, Mo., tornado. The buildings in background were outside the destructive path.*

*Right—Steel and concrete cannot withstand the power of the tornado. An impenetrable vault falls victim to a passing tornado. This is an outstanding illustration of the violence of a tornado.*

Official photograph, United States Navy.

*A waterspout, the counterpart on water of a tornado on land. This is the Pensacola waterspout of June 14, 1929.*




*This sketch shows the whirling forces of the tornado funnel. Compare this sketch with the photo at the top of the page.*

Nearly two thousand major tornadoes have been recorded during the past thirty years. The number of lives lost in these storms has exceeded five thousand, and the property losses have been reckoned in many millions of dollars. When a tornado passes over the open plains it may never be reported, but, if it should strike some town or village along its path, it is heralded far and wide as a great wind-storm. Should just a single small school building be in its path the death toll might be heavy.

The last year having complete tornado records (*Continued on page* 266)

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# "As Simple as A-B-C"

***But the Trail to the Origin of Our "Simple" A-B-C Leads Back Through Ancient Pirate Cities to a Forgotten Turquoise Mine in the Desert of Sinai***

*Wilicst traders of their time, the Phoenicians were equally adept with pen and sword, and used each as circumstances warranted. Of all ancient peoples, they seem to have the best claim to the invention of the alphabet.*

**By Count A. N. Mirzaoff**

THE trail to the birthplace of the alphabet is warm again.

For a long time we knew that the trail followed the road to Rome. From there, still plain, it led to the shores of Greece and its old city states. More faintly, but none-theless certainly, it took scholars to Phoenicia, that ancient loosely connected group of communities which once filled the Mediterranean with merchant sails.

And there it ended. The wise Cadmus, mythical Phoenician loved by the Greeks, guarded his secret well. Two thousand years ago the natives of the Grecian peninsula had placed the alphabet to his credit. Modern archeologists could not deny the legend's truth. They sweated over Egyptian hieroglyphs. They labored over mysterious inscriptions found in Crete. And in the end they were able to offer no better explanation than that which the Greeks accepted two thousand years ago. Between the pictographs of Egypt and the sound symbols of Phoenicia there was simply a gap, nothing more.

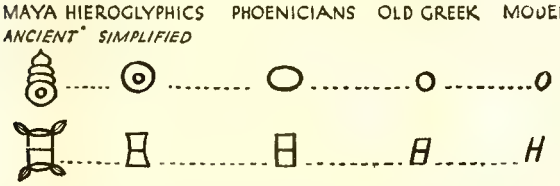
Now, far out in the wastes of Sinai, the trail reappears. An expedition sent out by Harvard and the Catholic University has discovered an actual geographic meeting place of the writing forms of the Egyptians and those of the Semitic tribes, of which the Phoenicians unquestionably were one.

On the walls of a ruined temple erected to the Egyptian goddess Hathor, Egyptian symbols have been found inscribed. Cairns and rock shelters in the vicinity yield fragments containing what undoubtedly are Semitic inscriptions. It is fairly well established that the writings were placed on walls and fragments at the same period—about 2000 B. C.

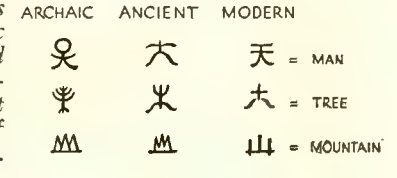
Years ago Sir Flinders Petrie, noted archeologist, found apparently the same group, or part of it, of inscribed rocks uncovered by the present expedition. Among the hieroglyphs he photographed at the time were symbols which, while resembling hieroglyphs, defied translation as Egyptian. Several years later, two English scholars announced that these signs were not to be interpreted on the pictographic principle, but on the phonetic. They had been arbitrarily chosen to represent consonants in the ancient Semitic tongue.

Using this clue, a German scholar translated most of the inscriptions and showed the relation between the characters which composed them and those of later Semitic alphabets. The present re-examination of the inscriptions indicates with practical certainty that from the hieroglyphs of ancient Egypt were derived the first forms of the symbols which comprise our alphabet today.

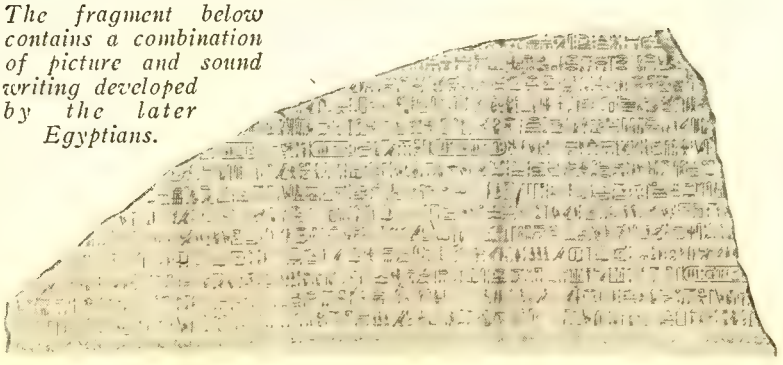
Of course, however, this is not the root of the matter. The crucial question remains. How was it that the Semites were able to discover and apply the principle of a sign to represent an elementary sound in their tongue as it was spoken—a principle which rendered written communication immeasurably simpler, more flexible, and more exact than any pictographic or ideographic method that could be




*The chart on the left shows how ancient pictographic signs were used for sound characters, and later simplified. The right-hand chart illustrates the simplification of China's ancient pictographs.*




*The fragment below contains a combination of picture and sound writing developed by the later Egyptians.*



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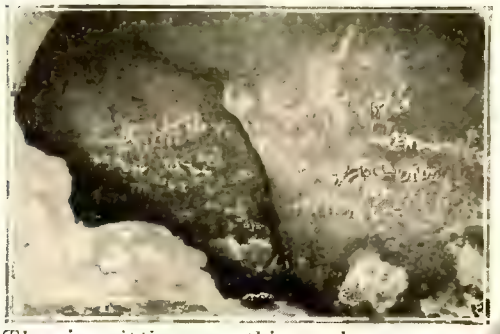
devised? The Egyptians passively supplied the symbols, or some of the symbols; but that, while interesting from the historic standpoint, amounts to precisely nothing as an intellectual achievement. Any other symbols would have done as well. . . . But the great leap from the pictograph to the phonetic symbol for the elementary sound—that is a piece of inventiveness which no declamation on the evolutionary nature of things will suffice to explain. The signs are insignificant. The idea is all-important. The Semites made the jump; the Egyptians remained bogged in their clumsy, complicated pictographs. That is the vital fact.

The original attraction for both Egyptians and Semites at the site of the findings seems to have been a deposit of turquoise. Later, both peoples appear to have established religious shrines near by. The monuments of each are clearly separated from those of the other. One wonders why, while the Semites borrowed symbols from the Egyptians, the latter did not take advantage of the opportunity to adopt the marvelously simplified writing method of the Semites.

*Above appear ruins characteristic of the Desert of Sinai, stamping ground of the ancient Semitic tribes. It is here that the meeting place of the Egyptian and Semitic cultures has been found. . . . The rock shown at the left was found in Written Valley, Arabia. Note the mixture of alphabetic signs, a rare exhibit in the alphabet's history.*



*The inscription on this rock, found near Mount Sinai, includes characters recognizable as those used by the Phoenicians.*

The answer perhaps must be sought in the political and economic schemes of the two peoples. The feudal economy of ancient Egypt doubtless was well served by the ponderous pictographic method. The nomad Semites, on the other hand, very likely found emergencies in their tribal life which required a more flexible and accurate means of communication, and so, under pressure of circumstance, they developed the phonetic form.

On the trail now, not of the ancestral symbol, but of the vital idea behind the phonetic character, it may be that we shall have to back-track to the shores of the Mediterranean and consider anew the character of Cadmus the Phoenician. . . . And particularly the forces which shaped that wily fellow's life.

First of all we know the Phoenicians as a race of crafty traders or of rapacious plunderers. It all depended. . . . In our own rather tedious way we declare that the Pen is mightier than the Sword. But Cadmus was not hampered by such maxims. In his swift ships he sailed the Mediterranean with a single overmastering thought in his busy brain—to wit, Get It While the Getting Is Good. And he let the circumstances determine the means. If he landed on some fruitful coast and found formidable armed forces in the way, he was a trader of the humblest sort, all set to sign contracts, guarantees, and receipts. When no such obstacles impeded, he left the reed pen in its case, went ashore with his cutting tools ready for action, and persuaded the natives to surrender their goods on a non-compensatory basis.

*At the right is the so-called "Rock of Moses," on which many Phoenician characters can be seen.*

Pursuing this active method of gaining health, wealth, and wisdom, Cadmus established branch offices, many of them, along both sides of the Mediterranean. And whether he came first with sword or with pen, assuredly it did not take him long to make his influence (*Continued on page 270*)

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# Sailing Craft *of the* Air

***The Aviation Editor Offers Information Regarding Gliders Now Purchasable in the United States. On Page 232 You Can Begin Learning How to Build One of the Very Best Type***

Curtiss Aeroplane & Motor Co., Inc.

*Above—Glenn Curtiss is shown in a hydroglider he flew at Port Washington, L. I., September, 1922. Left—Wiley Post, Lockheed pilot, takes his first flight in a Detroit Aircraft "Gull."*

## By Augustus Post

*Aviation Editor*

THE type of glider in which most American students are interested is the primary ship, plans for which have already been published in SCIENCE AND INVENTION. A primary ship is easily made by those who have had considerable mechanical experience, but clubs or other groups intending to build one should have expert advice on its construction.

The Alexander Aircraft Company of Colorado Springs is said to be the first American airplane maker to use its own plant and trained craftsmen in glider manufacture. The Alexander Trainer has a wing spread of 36 feet and a wing area of 196 square feet. Strength and lightness are obtained by the use of a welded fuselage of seamless chrome molybdenum steel tubing. Three-roll shock absorbers cushion the steel structure in landing. Other features include an adjustable seat, a safety belt, and a prow hook both automatic and voluntary in action. The Alexander glider in sold for $375.00 at Colorado Springs.

Production of the "Gull," a primary ship built by Gliders, Inc., a division of the Detroit Aircraft Corporation, has been increased from 166 to 200 as an initial factory order. Philadelphia Airways recently ordered fifty of these ships, and the St. Louis Glider Club, headed by H. D. Kuchins, signed up for five. Mr. Kuchins is developing the world's first glider port at St. Louis—a piece of enterprise which deserves imitation throughout the country. It is of great aeronautic importance that gliding fields should be established near all cities of consequence, under municipal auspices, so that those who want to learn gliding may do so under right conditions and have the advantage of expert supervision.

(*Continued on page 281*)

Detroit Aircraft Corporation

### Gliding and the Student Aviator

***By James Work***

*Vice-President, Detroit Aircraft Corporation*

*WITHOUT a doubt, gliding is the most efficient method of primary training for the young man who intends to become an airplane pilot.*

*The glider has no engine to disturb the nerves of the student and no array of instruments to be watched. It leaves the ground at a speed of 20-25 miles an hour, and the student can concentrate entirely on maintaining stability and balance. Once in the air, the "stick" is pushed slightly forward from neutral, and the ship settles to a graceful, shockless landing. After a few short flights the student can easily manipulate the controls, banking and turning as he would in a powered plane.*

*Often the novice, after a few flights, can qualify for a third-class glider pilot's license in the National Glider Association. This requires only that he keep his ship in the air for thirty seconds after taking off from a hillside.*

*Controls on a soaring ship, as on the primary, are similar to those of a motored craft. They include the "stick" or control lever for elevators and ailerons, and the rudder bar from which the fin is controlled. Some of the latest soaring machines have adjustable stabilizers to compensate for difference in the weights of pilots.*

*A one-minute flight that includes a complete "S" turn, or one to right and left, earns the student a double bar, or second-class license in the Association. A soaring flight of at least five minutes gives him the three-star or first-class license.*

*With the growing interest in glider flight, the $2.000 prize offered by Edward S. Evans, Honorary President of the Association, for a ten-hour continuous flight, soon will be won.*

*Ready for a take-off in a primary motorless glider.*

Detroit Aircraft Corporation

*A hydroglider built by Gliders, Inc., of Orion, Mich., which has been successfully flown.*

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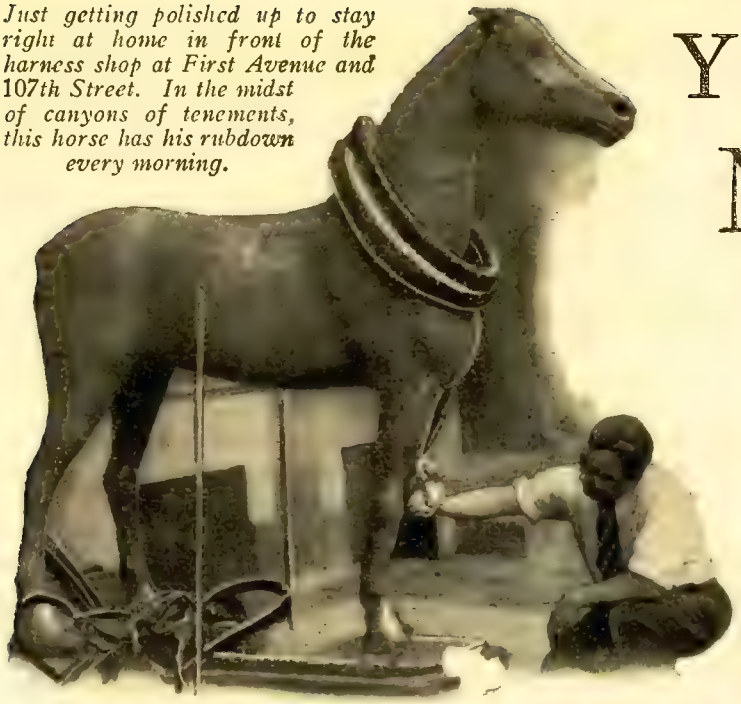
# You MUST See New York!

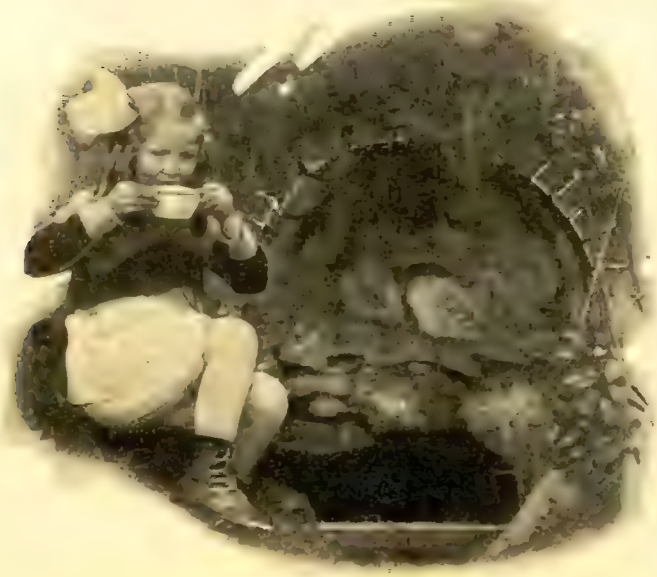


*Just getting polished up to stay right at home in front of the harness shop at First Avenue and 107th Street. In the midst of canyons of tenements, this horse has his rubdown every morning.*

*In the heart of Greenwich Village, where artists no longer starve, this sturdy smith still wields tongs and hammer on the town's truck horses.*

*New York has its "squatters." This one has built his home from the cupola of an old mansion, pieced out with other fragments from sources less distinguished. . . . The New Yorker shown below drinks her aqua pura right from the breast of Mother Nature, nor does she leave the city to do it.*

*Broadway, known to movie fans for its bright lights and broken hearts, echoes the creak of this old well as buckets of pure, cold water are drawn to the surface, at 208th Street.*



*While Commissioner Grover Whalen wrinkled his intellect over traffic problems and taxi rates, Fred Funk, one of his hired hands, pondered the correct way of approaching a mama cow. Cow is not Mr. Whalen's specialty. . . . This picture was made on the Gay White Way.*

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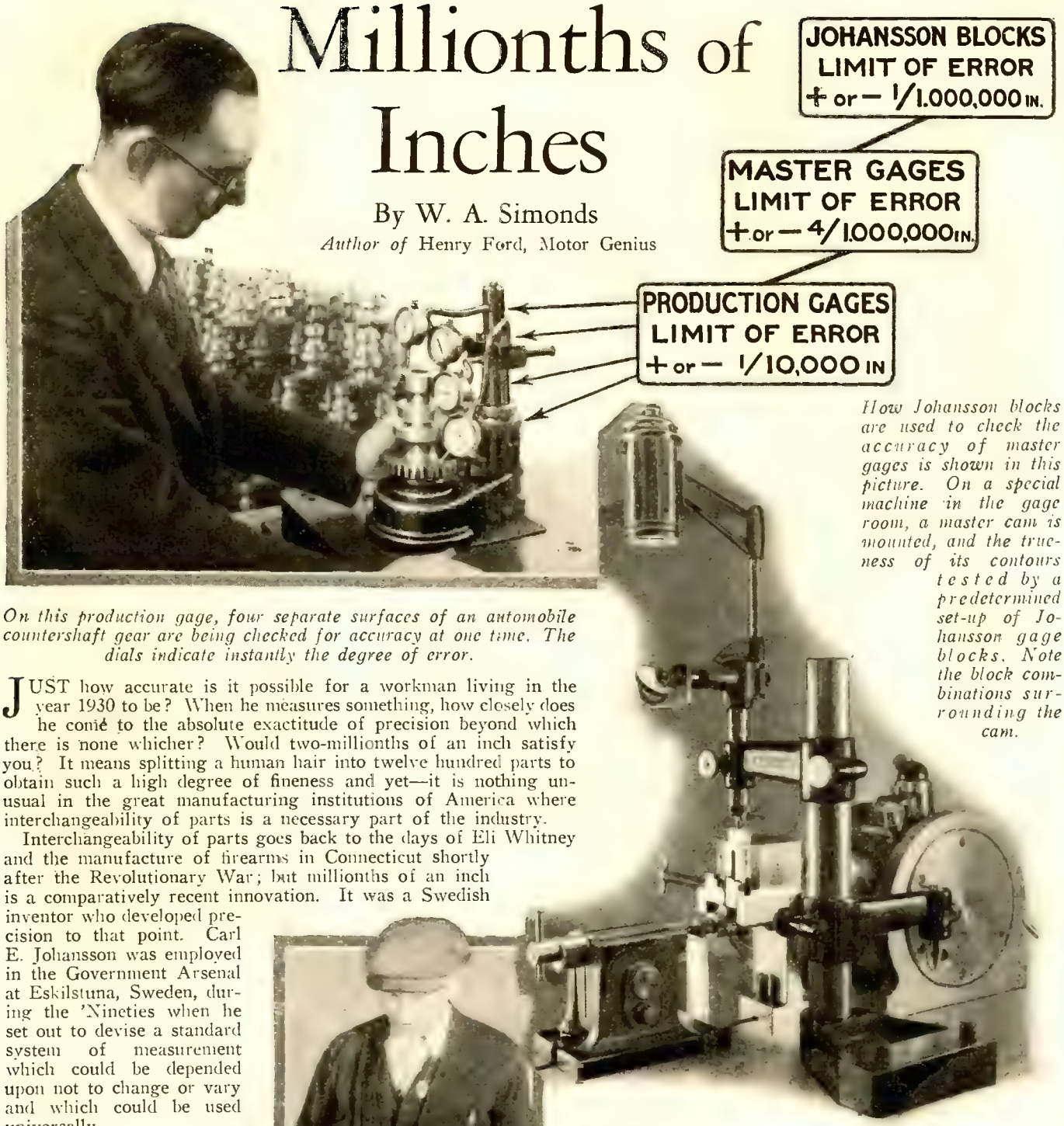
# Millionths of Inches

By W. A. Simonds
*Author of* Henry Ford, Motor Genius



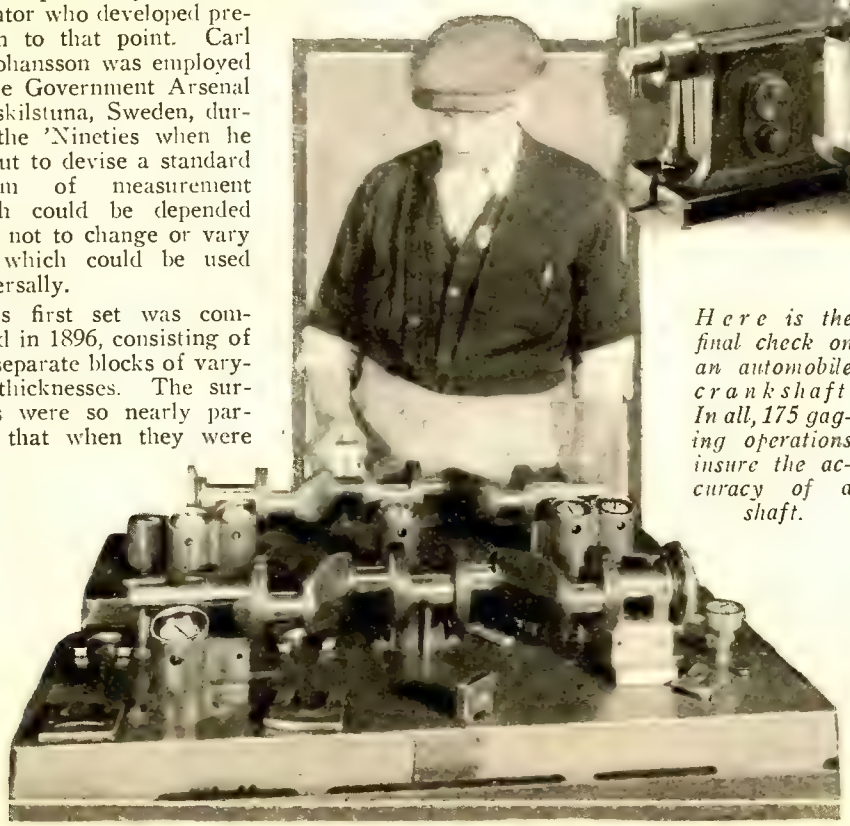

*On this production gage, four separate surfaces of an automobile countershaft gear are being checked for accuracy at one time. The dials indicate instantly the degree of error.*

*How Johansson blocks are used to check the accuracy of master gages is shown in this picture. On a special machine in the gage room, a master cam is mounted, and the trueness of its contours tested by a predetermined set-up of Johansson gage blocks. Note the block combinations surrounding the cam.*

JUST how accurate is it possible for a workman living in the year 1930 to be? When he measures something, how closely does he come to the absolute exactitude of precision beyond which there is none whicher? Would two-millionths of an inch satisfy you? It means splitting a human hair into twelve hundred parts to obtain such a high degree of fineness and yet—it is nothing unusual in the great manufacturing institutions of America where interchangeability of parts is a necessary part of the industry.

Interchangeability of parts goes back to the days of Eli Whitney and the manufacture of firearms in Connecticut shortly after the Revolutionary War; but millionths of an inch is a comparatively recent innovation. It was a Swedish inventor who developed precision to that point. Carl E. Johansson was employed in the Government Arsenal at Eskilstuna, Sweden, during the 'Nineties when he set out to devise a standard system of measurement which could be depended upon not to change or vary and which could be used universally.

His first set was completed in 1896, consisting of 111 separate blocks of varying thicknesses. The surfaces were so nearly parallel that when they were placed together to form a combination measurement, the cumulative error in the group of blocks was no greater than the error in a single block of the same length as the combination. In other words, no allowances had to be made for air spaces between the walls of adjoining blocks. In fact, when wrung together, the blocks would adhere as though magnetized.



*Here is the final check on an automobile crankshaft. In all, 175 gaging operations insure the accuracy of a shaft.*

Introduced into this country in 1907, for a time the gage blocks were regarded more as a novelty than as something of value to manufacturing. The International Bureau of Weights and Measures at first repudiated the claims made for them, but finally worked over the gages for three years and in 1912 certified that they were as accurate as had been represented. (*Continued on page* 271)

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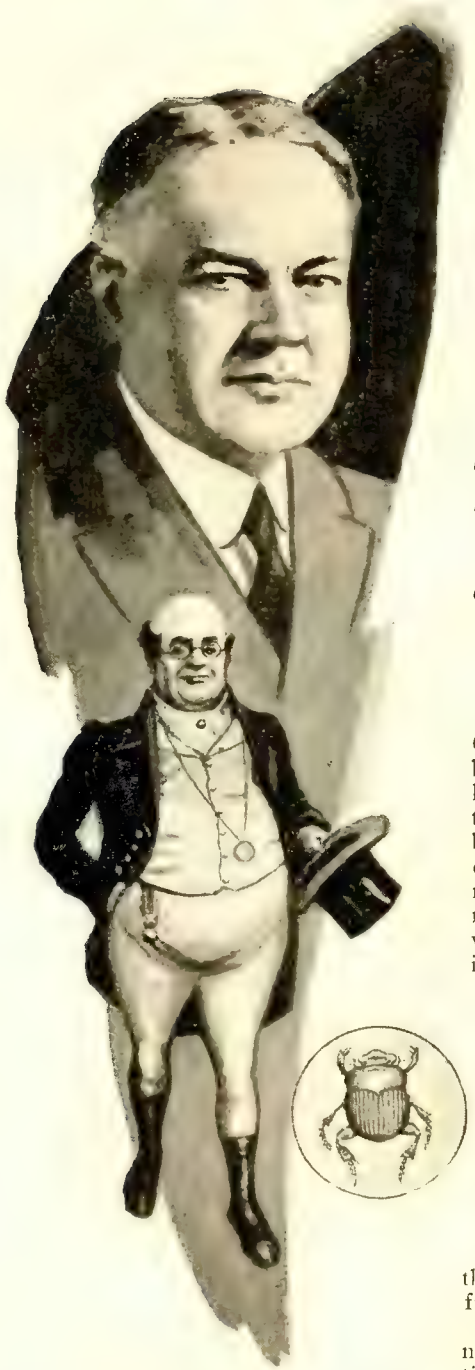
# Which Type Are You?

## *Science Now Has a System of Size-Ups that Makes Your Build an Index of Your Personality*

By Edward J. Beck



*The classic example of the "pyknic" type is Mr. Pickwick, one of Dickens's most popular characters. With this type our present chief executive seems closely to agree. . . . Pyknic types exist also in the insect world.*

GIVE an up-to-date medical man a yard-stick or a pair of calipers, let him measure your body with much less detail than a tailor would require, then allow him time to make some simple calculations on the back of a calling-card and he'll tell you a volume about yourself. He'll reveal your character, the way your moods run, some of the diseases to which you are susceptible and those to which you are immune. He'll label you "pyknic" or "asthenic" and there's a book full of implications in both these tags of personality!

In other words, types for the forty-eleventh time are back with us again. Once more you may entertain yourself by trying to figure out in which pigeonhole you belong and still feel scientifically respectable. To date it has *not* been scientifically respectable to speak of types or take stock in character-reading any more than in the tea-leaf racket or palm-readings. The hard-working and precise psychologists have insisted that human qualities exist only as fine gradations shading off into one another, not as clear-cut entities like "weak will," "aggressiveness," "imaginativeness" and so on. By many tests they showed that you could not judge people by their looks. But now the very types which psychologists kicked out the front door have sneaked back through the medical door, each with a full-dress suit on and an alias.

The type-idea, backed by some eminent medical names, rests, for the first time, on many actual measurements and correlations. The former hunches, general observations and sheer charlatanism have been replaced by the method of science.

Human beings, it is now said, are constructed in two general types of body-architecture. At one end of the scale, you find the *long-thins*, the lanky bean-poles of humanity. They are called asthenics. At the other extreme, are the *short-thicks*, known as pyknics. In between are various gradations of these extremes.

Funny names these—doctors seem to like them. "Pyknic" is easy to remember and understood because, just by coincidence, picnic and Pickwick are ready-made synonyms. Pyknics do love picnics—any kind of eating, indoor or out. They're built with the same beam or wheel-base as Mr. Pickwick.

Dr. George Draper of Columbia University, whose "Human Constitution" is a standard manual on the technique of measurement and classification, includes a portrait of this Dickens's character as Exhibit A of what he means by pyknic. Amos, of Amos 'n' Andy, is an asthenic; big businessman Andy is a pyknic.

Prof. W. M. Wheeler, in the *Quarterly Review of Biology*, differentiated the two types thus. "The asthenic," he says, "is pale, scrawny, long-limbed with narrow head and face, long narrow straight nose, small often receding chin, narrow chest and abdomen, deficient development of fat and musculature, reduced body hair but often abundant cranial thatch. (*Continued on page* 273)

*Don Quixote is the classic "asthenic," and it is perhaps more than coincidence that Henry Ford has many times been compared to Cervantes' famed creation. . . . Here, too, we have an insect type which corresponds.*

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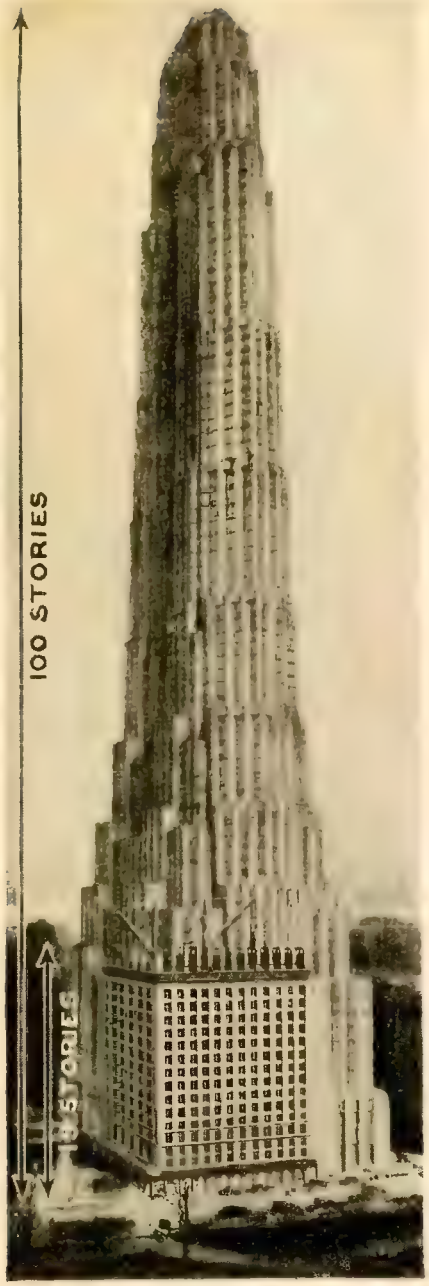
# Towers Pierce *the* Clouds

## *Building* 100 *Stories High, with Population of* 30,000, *in Prospect*

By Marguerite Kujawska



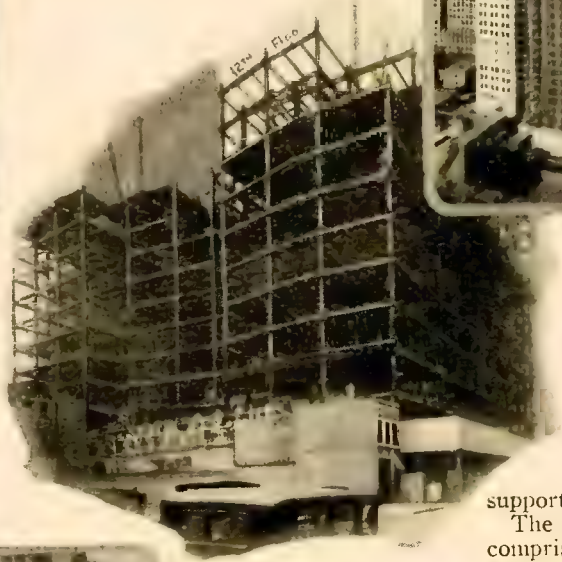

MANY a misty Manhattan day has seen the Woolworth Tower's top hidden in rolling clouds, invisible to all but airmen flying above the city. . . . Now, after years of supremacy, the famous tower has been surpassed in height by the midtown Chrysler Building, which reaches into the clouds a total of 808 feet to the Woolworth's 792.

But structures of greater height are in prospect, and one of them is certain to reach completion in the comparatively near future. This is the Empire State Building, which when completed will have a total of 87 stories to the Chrysler's 67, and will rise, without its proposed mooring mast, to a height of approximately 1062 feet.

It is when we come to the second of the prospective structures, however, that the office building of the future presents itself in its most astounding development.

*Left — Prospective Metropolitan Life Building, compared with structure it replaces at Fourth Avenue and 25th Street, New York.*

*In the picture at the left the 808-foot Chrysler Building has been advanced to its 67th floor. The Chanin Tower appears at the left of the structure. Above is shown the "cupola" with its mighty spire of stainless steel—highest point on Manhattan—looking toward the East River and Long Island.*



*In ascending order, four successive stages in the construction of the 67-story Chrysler Building are shown here. Note in the picture above how the work of bricklayers has been put on a systematic basis of mass production*

The proposed building of the Metropolitan Life Insurance Company, at Fourth Avenue and 25th Street, is designed as a structure which ultimately may be built up to 100 stories; and though the immediate plan calls for the erection of but 32 stories, the foundations to be laid are definitely calculated to support the 100-story structure.

The Metropolitan's home office force comprises more than 12,000 employes, but the rate of expansion points to a future payroll of 30,000 employes as a practical possibility, and it is this the company has borne in mind.

Truly modern in conception is the company's proposed structure. To the first setback the materials used would include a considerable proportion of masonry. But above that point the building would be carried out entirely in metal and glass. No extraneous ornament would be applied. The vertical accent of the immense building would be emphasized by the corrugated form of the structure.

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Crane Company

*The bathroom above, while not very prepossessing, is typical of many in older houses. To the right is the same bathroom with modern equipment. Note the improvement in the floor, walls, wall fittings, and medicine chest in place of the cluttered up shelf.*

# Bathrooms *à* La Mode

By S. Gordon Taylor

**This is the Fifth Article in Our Home Improvement Series by S. Gordon Taylor. The first, which appeared in our March issue, dealt with Basement Improvement; the second (April) covered Insulating the Home; the third (May) dealt with Roofing; the fourth (June) was devoted to Paints and Decorations. The August article will deal with Flooring; in September Fireplaces and Heating Equipment will be discussed, and Wiring will be the subject in October.**

United States Gypsum Company

*This attractive modern bathroom has walls of "Chromite," a sheet tile of metal alloy with a baked-on, colorful, lustrous surface.*

JUST one hundred years ago the first regular bathtub was built in America—a massive affair of mahogany and lead which weighed over 2,000 pounds. It was considered such an extravagance that the thrifty fathers of New England made the installation of bathtubs unlawful and in Virginia a tax of $300 was levied on bathtub installations. Yet today 68 per cent of American homes are equipped with bathtubs, with a constantly increasing demand that results in an annual sale of about 1,000,000 tubs.

The question today, in planning a home, is not—"Shall we have a bathroom?"—but rather, "How many bathrooms will we need?" Comfort and convenience dictate the necessity for providing adequate bathroom facilities in old homes as well as new.

Plumbing and Heating Industries Bureau

*Why not utilize waste space? To the left is an irregular hall end . . . to the right, the same hall after it has been converted into a bathroom, at a comparatively slight cost.*

Many owners of existing homes do not appreciate the opportunities offered by unused hall ends, closets, and other wasted areas. A space as small as six feet by five feet will accommodate a toilet, lavatory and shower, or a small bathtub. Almost every house will find some space available for additional facilities; it is frequently possible to partition off part of one bedroom to provide the required space.

A toilet or a toilet and lavatory is an almost essential part of the downstairs layout. The logical location is just off the kitchen for convenience in running the plumbing lines. Such an improvement is a step-saver and is particularly useful where there are small children in the house. In a new home it is a simple matter to provide space. In an existing home part of the pantry may be partitioned off for this purpose. Waste space under the stairway, or an existing closet may provide possible locations.

With the growing tendency to make use of waste space in basements for playroom and entertainment, many owners are providing a lavatory and toilet in this area and perhaps even a shower. For seashore or lake front homes, a shower in the basement is a decided advantage as it eliminates tracking sand and water through the house. A shower installed in the garage or in the yard provides endless comfort and fun for the children during warm summer weather.

Beyond providing

(*Continued on page* 279)

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# *Building the* Cornet Short

By George R.

***In the February and May Issues We Told of Several Short-Wave Sets Which Could Be Bought in Kit Form and Assembled. Here Is One of Unusual Performance Which You May Build At Home***

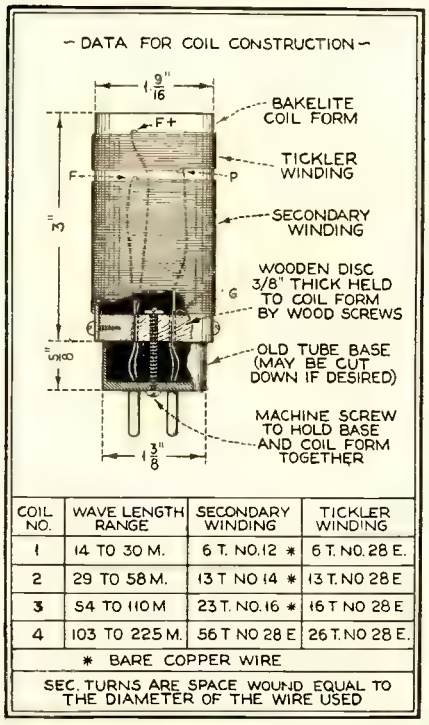
WE MIGHT start this article on the construction of the Cornet Short-Wave Receiver with the entire history of short-wave reception and subsequent developments in the art. We don't think, however, that such a tedious document would improve the results obtainable from this set, originally designed by Lieutenant W. H. Wenstrom and now improved and rebuilt by the laboratory staff of RADIO NEWS. Consequently we shall set a precedent, and dispense with extraneous noises. If we must give a reason for this story, we would say that it is because so many people showed themselves interested in the short-wave articles in the February and May issues of SCIENCE AND INVENTION.

The set is a three-tube circuit, containing a regenerative detector and two stages of resistance-coupled audio. Four plug-in coils allow this receiver to cover the band from 14 to 225 meters. In addition it may be used with either a loud speaker or ear phones. In the detector circuit the grid is controlled by means of a potentiometer shunted across the filament leads; the grid leak return goes to the center arm of the potentiometer. Another refinement of the circuit is antenna coupling to the secondary circuit by means of a coupling condenser instead of through the customary primary coil. The plug-in coils are tuned by means of a variable condenser, which spreads the tuning over 270 degrees instead of the usual 180, thus obtaining a greater separation between stations. The use of a vernier dial for both the tuning and regeneration condenser permits easy control of the receiver.

The receiver is built on aluminum chassis, the three tubes, the tuning and regeneration condensers, the r.f. choke, the coil mount, and the antenna condenser being mounted directly on top. Below the chassis are mounted the various filament ballasts, the connector cable receptacle, and the coupling condensers and resistors. Below the chassis, but mounted on the main panel are the first-audio, second-audio switch, the grid potentiometer, and the tip-jack receptacle for the phone cords.

On the upper part of the main panel the dials for the two large variable condensers, the trimming condenser and the midget, which is shunted across the main tuning condenser for further vernier control, are mounted. The coils for the receiver fit into a regular four-prong socket, which is supported from the surface of the chassis by means of a bakelite shelf erected on four tubular spacers. In this manner the coil is not affected by detuning effects caused by a mass of metal in its immediate neighborhood. In addition, the coil is raised sufficiently so that it is merely necessary to remove the cylindrical cover on top of the cabinet, grasp the coil and remove it, when shifting from one wave band to another.

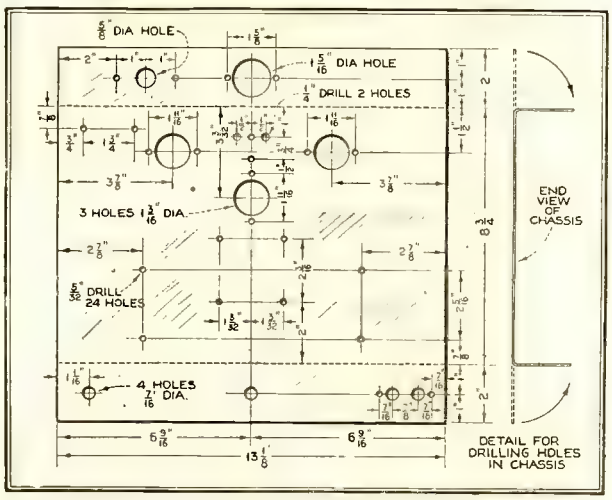
In the receiver built in RADIO NEWS Laboratory, manufactured short wave coils were employed, these being the Octo-coils. However, it is quite possible to wind a similar coil. The information necessary for the four coils covering 14 meters to 225 meters is given on this page. By consulting the schematic diagram of the Cornet circuit, one will see that a regenerative detector followed by two stages of audio amplification for loud speaker operation, are used. The first audio stage uses the screen grid tube and a resistance coupled amplifier. It is followed by a power output stage employing the 112A tube. By means of a jack switch it is possible to switch from the first to the second audio stage without disturbing any of the connections of the receiver.


DATA FOR COIL CONSTRUCTION
BAKELITE COIL FORM
TICKLER WINDING
SECONDARY WINDING
WOODEN DISC 3/8" THICK HELD TO COIL FORM BY WOOD SCREWS
OLD TUBE BASE (MAY BE CUT DOWN IF DESIRED)
MACHINE SCREW TO HOLD BASE AND COIL FORM TOGETHER
F+
F-
P
G

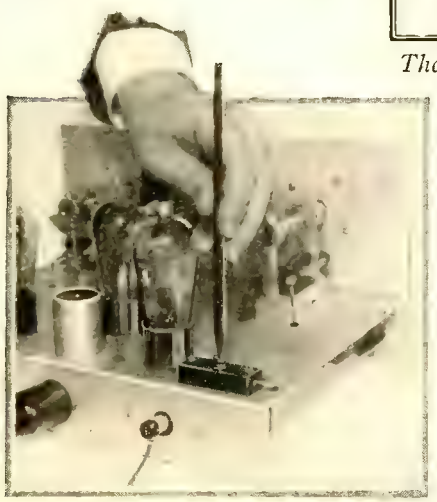
| COIL NO. | WAVE LENGTH RANGE | SECONDARY WINDING | TICKLER WINDING |
|---|---|---|---|
| 1 | 14 TO 30 M. | 6 T. NO.12 * | 6 T. NO.28 E. |
| 2 | 29 TO 58 M. | 13 T NO 14 * | 13 T. NO 28 E |
| 3 | 54 TO 110 M | 23 T. NO.16 * | 16 T NO 28 E |
| 4 | 103 TO 225 M. | 56 T NO 28 E | 26 T. NO 28 E. |

* BARE COPPER WIRE

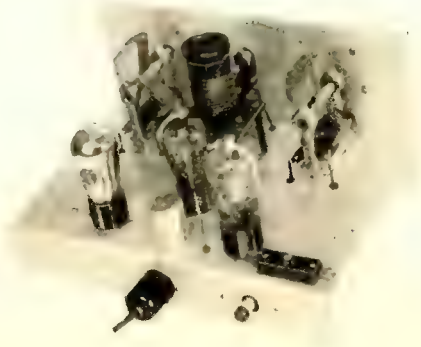
SEC. TURNS ARE SPACE WOUND EQUAL TO THE DIAMETER OF THE WIRE USED




*The data for winding the coils and the complete layout of the chassis are given above.*



*The antenna condenser is adjusted with a bakelite rod in the form a screw-driver.*



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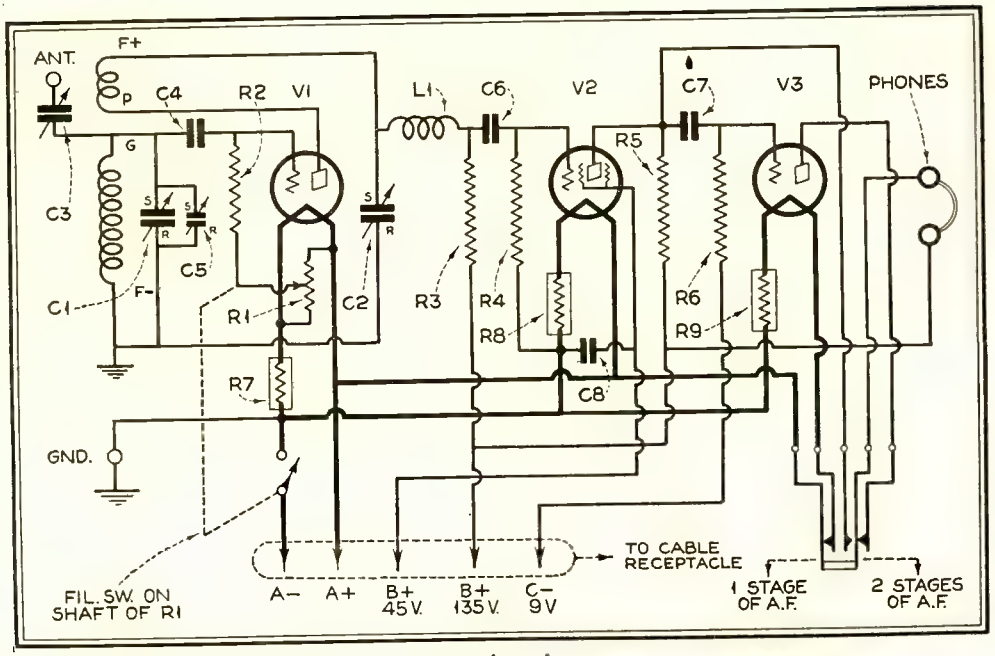
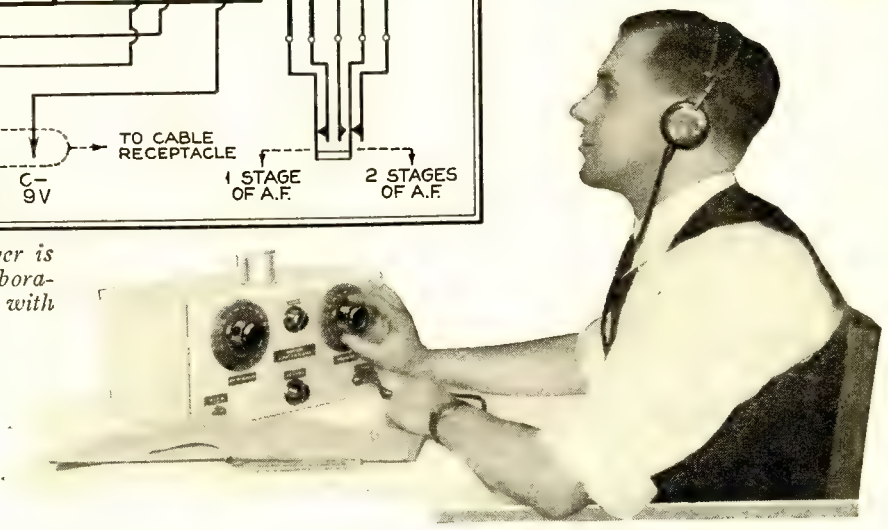
# Wave Receiver

Brown

***With Four Plug-In Coils This Receiver Will Cover Wavebands from 14 to 225 Meters. It Is Designed for Use of Loud Speaker in Addition to Head Phones***




*The schematic diagram of the Cornet receiver is quite easy to follow. Edward W. Wilby, laboratory technician of* Radio News, *is shown with his Cornet set.*



Practically all of the wiring is made underneath the chassis. In order that short circuits would not occur, due to rough edges of holes in the chassis cutting through the insulation of the wiring, eyelets were inserted in each of the holes drilled to pass wiring through from the top to the bottom of the chassis.

It is only necessary to plug the cable into the receptacle mounted on the back of the chassis in order to make the receiver ready for operation. Before doing this, it is of course necessary to have the leads of the cable connected to the various batteries as indicated in the schematic diagram.

There is only one adjustment necessary. That is, the adjustment of the antenna series condenser, C3. The correct adjustment of this condenser will depend on the length of antenna employed. With a piece of wood or bakelite rod sharpened to resemble a screwdriver, the control screw is turned first one way, then the other, until the best setting of the condenser is obtained.

## Parts List

C1—National equicycle condenser, .00015 mfd.

C2—National equicycle condenser, .00025 mfd.

C3—X-L variodenser, type N, 1.8 to 20 mmfd.

C4—Cornell grid condenser, .0001 mfd.

C5—Hammarlund midget (32 mmfd. revamped).

C6, C7—Cornell coupling condensers, .01 mfd.

C8—Cornell by-pass condenser, .1 mfd.

L1—Hammarlund polarized choke, 85 mh.

R1—Carter potentiometer, with switch, 200 ohms.

R2—Durham midget grid leak, 5 megs.

R3—Durham midget plate resistor, .1 meg.

R4—Durham midget grid resistor, .5 meg.

R5, R6—Durham midget plate and grid resistor, .25 meg.

R7, R9—Amperites, type 1A.

R8—Amperite, type 622.

Two National velvet vernier dials, 4-inch.

One National grid grip.

One Yaxley jack switch, type 45.

One Yaxley cable connector and plug, No. 660.

One Yaxley phone.

One Yaxley twin jack for phones.

Four Eby wafer sockets, 4-prong.

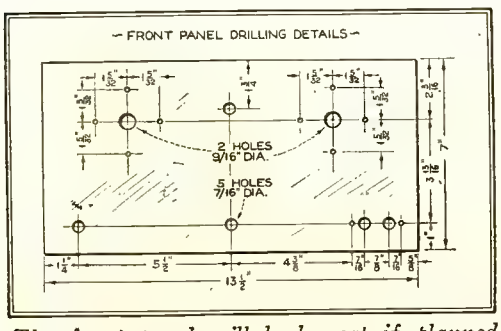
One platform assembly for coils.

One set Octo coils or home-made according to specifications.

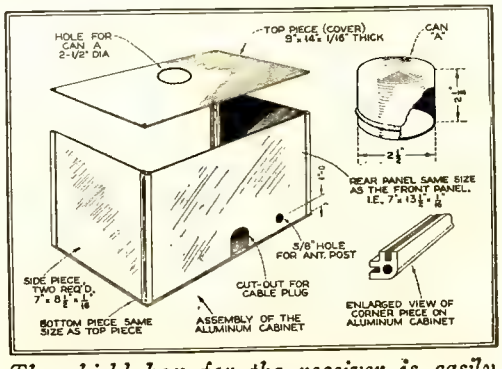
One X-L binding post and insulated strip.

Metal for chassis and cabinet.

Bus bar, solder, etc.




*The front panel will look neat if planned and drilled as shown above.*


HOLE FOR CAN A 2-1/2" DIA
TOP PIECE (COVER) 9" x 14" x 1/16" THICK
CAN A
REAR PANEL SAME SIZE AS THE FRONT PANEL, I.E., 7" x 13 1/2" x 1/8
5/8" HOLE FOR ANT. POST
CUT-OUT FOR CABLE PLUG
SIDE PIECE, TWO REQ'D. 7" x 8 1/2" x 1/8
BOTTOM PIECE, SAME SIZE AS TOP PIECE
ASSEMBLY OF THE ALUMINUM CABINET
ENLARGED VIEW OF CORNER PIECE ON ALUMINUM CABINET

*The shield box for the receiver is easily constructed.*

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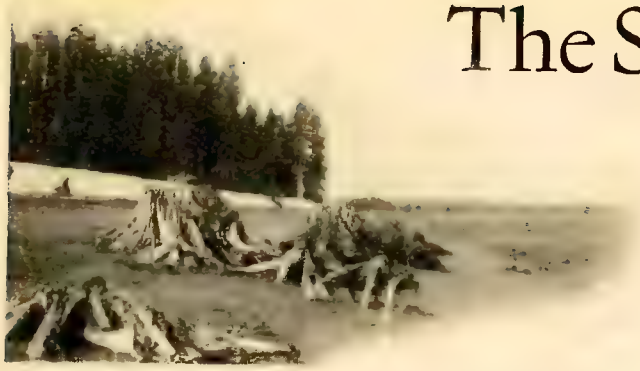
# The Sea Coasts Are Sinking

By H. J. Lutz

Photos Courtesy U. S. Forest Service



*Slowly, but surely, the coast line on Montague Island, Prince William Sound, Alaska, is sinking.*

*At low tide, large dead spruce trees are found, mute reminders of former coast lines.*

NO doubt most people consider sinking coast lines to be in the same category as uplifting of mountain ranges and other exceedingly slow geological processes. Such movements, because of their very slow progress, seldom catch hold of the imagination of those who are accustomed to thinking in terms of twentieth century speed.

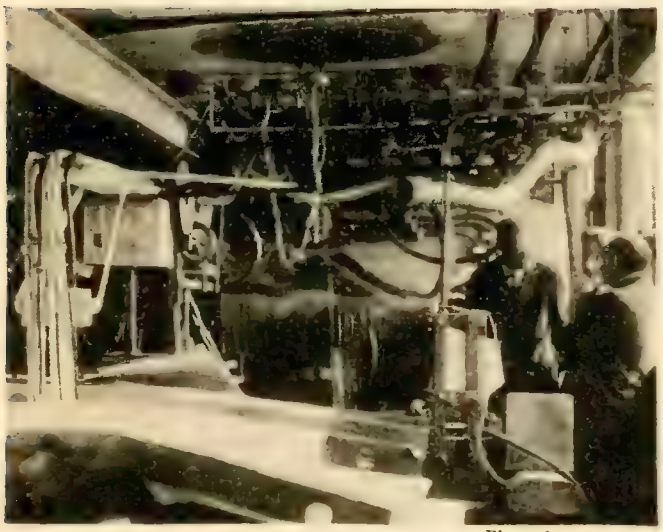
Working over long periods of time, however, such movements have wrought many of today's topographic features. It is well known that areas of land, by gradual sinking, may finally become lower than sea-level. Such areas, if along a sea coast, will then be submerged. Delaware and Chesapeake Bays, and Long Island Sound, are examples of wide open valleys which, due to sinking in past geological time, have become submerged, forming large estuaries. On the Atlantic seacoast the beaches at Atlantic City and Coney Island are steadily sinking.

In portions of the coast of southwestern Alaska active depression is occurring at the present time. Valuable historical light is shed on the situation by a report of the early explorer Vancouver, who visited the region of Prince William Sound in 1793. At that time he reported that in many places the sea coast had been sinking noticeably. He believed the depression was due to a rather sudden movement, occurring between 1783 and 1793.

The coastal subsidence first noted by Vancouver has continued for over 135 years. Slowly, but surely, the sea has encroached on its shores with the result that during this time a considerable land area has been submerged. While walking along the beach of Montague Island, in Prince (*Continued on page* 283)

# A White-Hot Storm of Sleet Makes Mirrors *for the* Moon!

By J. W. Hammond



*Through the nozzle which terminates the maze of tubing leading into the heavily screened furnace pit, tiny particles of quartz are sprayed over the rough quartz disc.*

Photos by General Electric Company

SHOULD you enter a certain section of the Thomson Research Laboratory at Lynn, Massachusetts, you would find yourself surrounded by round, squat furnaces topped with heavy metal sheets. . . . Mazes of tubing winding in and out with snakelike undulations, terminating in peculiar bulging nozzles. In one of these furnace pits you might see, through a tinted glass, a huge disc of quartz swept by a white-hot "sleet storm." The sleet is a powder of clear quartz, finer than flour, and it is blown upon the surface of the disc at a temperature of 3000 degrees Fahr. Slowly, automatically, the nozzle moves across the face of the disc, emitting its molten spray. At the end of several hours a thick, uniform layer of clear quartz grains covers the entire surface.

This is the new way that Professor Elihu Thomson, under the auspices of the General Electric Company, has found to make mirrors for the moon—reflecting discs for great telescopes. . . . And if his plans progress as experiments thus far indicate they will, the California Institute of (*Con'd on p.* 268)

*After being sprayed, the fused quartz blank is ground, preliminary to receiving its thin coat of silver.*

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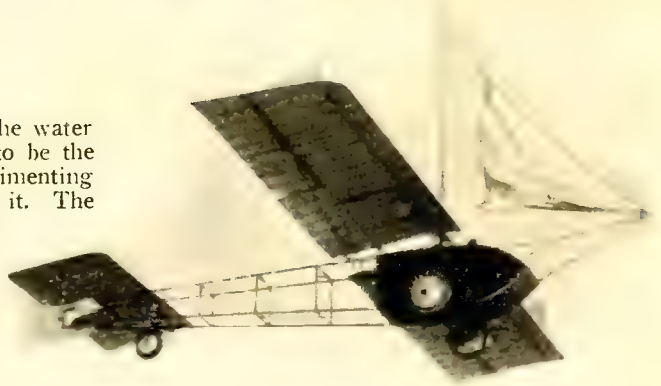
# *In the* Spotlight *of* Science

## And Now the Sail Glider

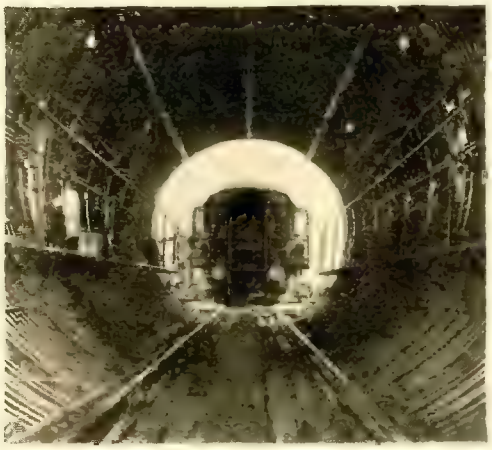
YACHTING is an old sport, and while it has been done in the water and on occasion on land, it remained for John Domenjoz to be the first one to apply the theory to the air. This man has been experimenting with glider flying and recently produced a glider with a sail on it. The glider is towed by an automobile, and after it is in the air, Mr. Domenjoz hoists the sail. He believes that with both the main sail and a jib he can glide through the air, using the sails as a motive power the same as a ship does. It will be interesting to watch the progress made with this sailplane. The experiments are being conducted by the Italian inventor at Old Orchard, Maine.



## Lindberghs Cheat Time—Time Cheats Them

WHEN the Lindberghs made a new record for the trip from Glendale, California, to New York of 14 hours, 45 minutes and 32 seconds, for a total distance of 2,479 miles, not only did they fly the route 3 hours, 15 minutes and 29 seconds faster than it had ever been flown before, but they also lost three hours which they can never make up again.

Lindbergh's wristwatch on the morning of the flight registered 26 minutes and 20 seconds past 5 o'clock in the morning. When he and Mrs. Lindbergh landed they were informed it was exactly 11 minutes and 52 seconds past 11 o'clock the same evening. By their own watches it was only 8:11:52. By hopping the four zones between the coasts in one day they lost three perfectly good hours.



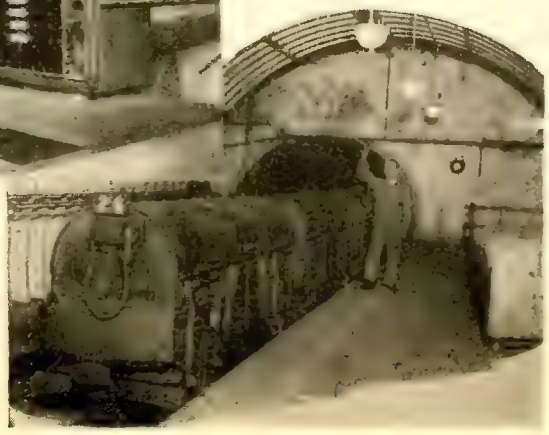
*A car of German Federal Railway Company entering an enormous disinfecting kettle to receive the formalin gas treatment which will destroy all vermin. This stunt might advantageously be copied by American railroads.*

## Railway Cars Treated Like Army Clothes

A NOVEL idea for cleaning and thoroughly disinfecting railway cars has been applied in Germany. Here the Federal Railway Company has erected three big disinfection plants, the one here illustrated being at Potsdam, near Berlin. After the car has been run a certain number of miles, it undergoes a thorough disinfection. The carriage is pushed into a sort of tunnel closed at one end, then a giant air-tight door closes the opening. The entire tunnel is filled with formalin gas, which is destructive to any and every living organism that may have found its way into the upholstery and frame of the car. The gas is non-injurious to any material used in the construction and is sufficiently penetrative to produce excellent results.

## Special Subway for Mail Only

*Watching the illuminated board to determine the position of the trains in the 6½-mile mail subway.*



*When the bell cord is pulled it is a signal for the operators in the underground station to start the mail train.*

IN England there is a post-office tube railway that stretches for a distance of 6½ miles. It carries nothing but mail between Whitechapel and Paddington. The mail bags are loaded on the train at the General Post Office and they are then conveyed in the small driver-less trains at a speed of 25 miles an hour. The trains carry a daily load of 23,000 bags of mail and operate on a two-minute schedule. Every two minutes a train full of mail is started from one terminal and simultaneously one from the other. Within a period of one hour 300 tons of mail can be transported in each direction.

The movements of the train in the tube are controlled by an attendant at an underground station of the Mount Pleasant Post Office. In front of him there is a board illuminated with little spots of light that mark the progress of each train through the tube. He can control the speed and also the switching of the train to any track desired. He receives his signal *via* an overhead cable, which is pulled by the man in charge of the loading of the train. Each train in this system is practically hermetically sealed and each car is divided into compartments so that there is very little danger that a fire starting in the mail bags might spread to other parts of the conveyor.

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## Chemical Ripening of Fruits and Vegetables

*Two sections from a row of celery in the field. The right portion was covered with canvas and treated with ethylene, while a portion on the left of the same row was left in the open.*

*The photo above shows two crates of celery from the same row. The one on the right has been treated with ethylene; the one on the left was untreated. One can readily observe the ripening effect of the gas.*

Photographs courtesy Department of Botany, University of Minnesota

DR. ROBERT STEWART, Dean of the College of Agriculture of the University of Nevada, at Reno, Nevada, reports some very interesting experiments are being conducted in chemical ripening of fruits and vegetables.

Fruits and vegetables can be plucked green and when fed small quantities of ethylene they can be ripened within a very short period of time. The texture and flavor of the fruit or vegetable are substantially the same as if ripened naturally. In the illustrations we see a tank with a gauge for measuring ethylene in commercial quantities. Of the two bunches of bananas, though both are the same weight, the one on the right has been treated with ethylene. They were both green forty-eight hours before this picture was taken.

## Phoning from Fast Train Across Land or Sea

TRAVELING at a rate of 60 miles an hour on an express train, Sir Henry Thornton, President of the Canadian National Railways, talked to Secretary Robert T. Lamont. Sir Thornton was railroading between Toronto to Montreal and Mr. Lamont was in his Washington home. The conversation officially opened telephonic communication between moving trains and distant points.

During the afternoon, as the special section of the International Limited made its run, speeds as high as 84 miles were attained. The apparatus worked perfectly even then and a two-way conversation was carried on between the train and various cities in the United States and Canada. A call was put through to England by way of the trans atlantic telephone, and except for static, which blotted out a part of the conversation, the experiment was highly successful. The speed of the train made no difference at all. There was no buzzing or blurring, and it is reported that the conversation was as clear as any call from New York to Albany.

The telephone was located in a special booth on the train. This publication reported several similar attempts. For further details see September 1929 issue.

## A New Unofficial Gliding Record

BECAUSE Jack Barstow failed to provide himself with a barograph, he is today the holder of only an unofficial record for sustained flight in a glider. Rules require that a barograph be installed in aircraft in order to gain official acceptance of new records. Barstow took off in a Bowlus sailplane with a 60-foot wing spread, and kept in the air for 15 hours and 13 minutes, landing within 1,500 feet of his point of take-off. The previous official American record was established by Hawley Bowlus of San Diego at the same place, Point Loma. The official world record for a sailplane is held by Ray Schultz in Germany, the time being 14 hours and 10 minutes.

## Glider Takes Off from Land and Water

THE average primary glider is not noted for its long flights, so one can well wonder what the purpose of an amphibian glider of the primary type might be. By stretching one's imagination, one will readily see that such a combination allows for the use of the glider near small bodies of water and the pilot can enjoy the sport of being towed either behind an automobile or a fast-moving motorboat, without the necessity of changing his landing gear.

Three San Diego, California, boys recently constructed such a glider, which has pontoons to support it on water and slats which act as skids for land operation.

*Left to right, John J. O'Neill, Science Editor, Brooklyn Daily Eagle; Arthur H. Lynch; Dunninger (in the cabinet), Mary Kellen of The New York Times, and Frank Decker, the medium.*

## Spiritualist's Attempt Fails

HAVING failed on his first attempt to collect the $21,000.00 in prizes that SCIENCE AND INVENTION MAGAZINE is offering for genuine spirit demonstrations, Frank Decker, a medium of international repute, defied Dunninger, the chairman of this publication's Psychical Investigation Committee, to duplicate by natural means the effects that he would produce. Decker, in the nude, entered a wooden box, the cover of which was screwed in place. The lights were turned out and trumpets moved and tambourines were tapped. Operating under the same conditions, Dunninger more then surpassed the medium. Note ectoplasmic streak alongside Dunninger's head. Believe us, it was produced by strictly natural means.

*All ready to start a flight in the amphibian glider.*

The photograph shows the glider being tried out on San Diego Bay by William Van Dusen, one of the inventors of this combination. It also shows the struts which support the pontoon, and it may give glider enthusiasts an idea for converting their land craft into the amphibian type.

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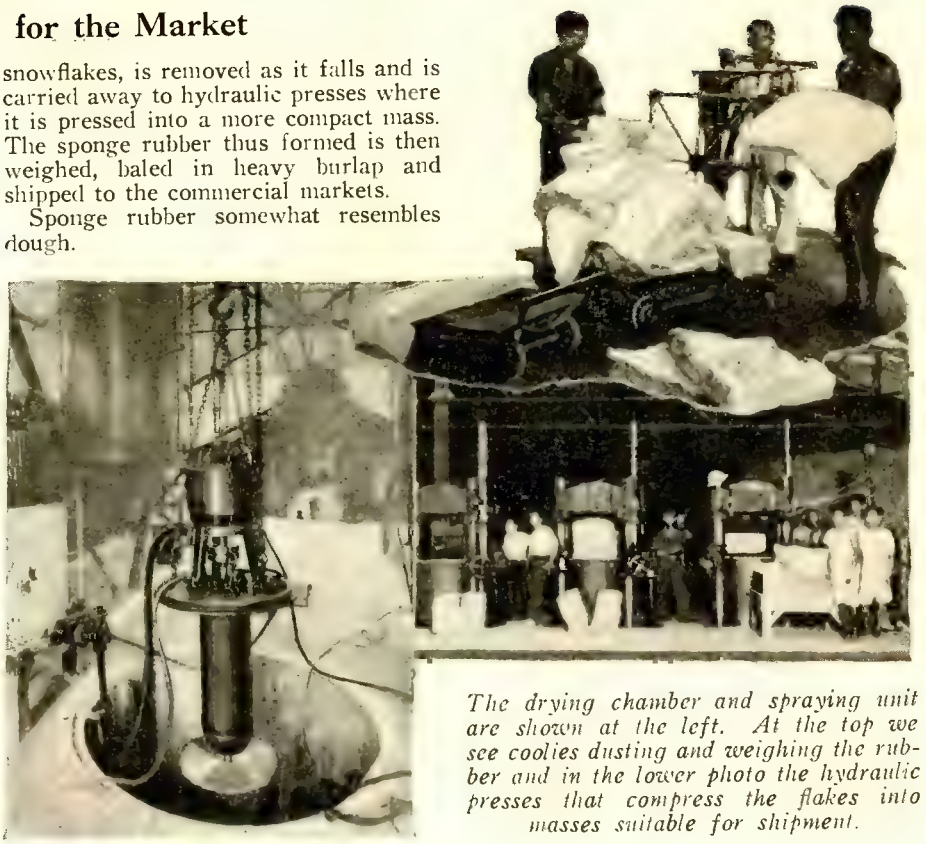
## Preparing Rubber for the Market

WHEN one talks of rubber in this country, one immediately gains the impression of a rubber tire or an article of hard rubber. Rubber itself is in a vastly different form before it reaches its commercial stage. At the United States Plantations, Limited, on the east coast of Sumatra, Dutch East Indies, are found many interesting sidelights on the rubber industry.

In the foreground in one of the appended photographs is an electric motor suspended from a block and tackle at the top of the building. Near the bottom of this apparatus and at the mouth of a pit there is an 18-inch disk which, when rapidly rotated, atomizes the latex. This process of atomizing gives a crude rubber that is superior in quality to that of the smoked sheet and the crêpe variety.

The method of spraying consists of allowing the latex to be poured upon the disc installed at the top of a drying chamber. The air of the drying chamber is heated to 350° Fahrenheit. The disc, rotating at a high rate of speed, causes the air to intermingle with the latex particles, and dries the particles without raising the temperature to a point that would unfavorably affect the rubber. The dried material, resembling snowflakes, is removed as it falls and is carried away to hydraulic presses where it is pressed into a more compact mass. The sponge rubber thus formed is then weighed, baled in heavy burlap and shipped to the commercial markets.

Sponge rubber somewhat resembles dough.



*The drying chamber and spraying unit are shown at the left. At the top we see coolies dusting and weighing the rubber and in the lower photo the hydraulic presses that compress the flakes into masses suitable for shipment.*

## Footprints 250,000,000 Years Old

PROMINENT geologists consider that the footprints of the newly named Cincosaurus Cobbi, found in hard carbonaceous shale at Carbon Hill, Alabama, are among the oldest and best preserved tracks of prehistoric animals. The animals are believed to be amphibians that existed before the dinosaurs, birds or mammals. The age of the tracks has been partially based on examination of the radio-activity of certain minerals at this depth. Many kinds of tracks were found there.

## New Music Created by Light Beams

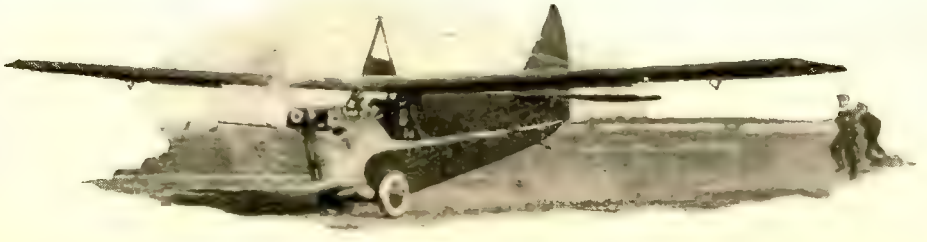
HOW would you like to strike the keys on a piano keyboard and find yourself playing a violin, a saxophone or an oboe? That is exactly what you will be able to do if the new musical instrument in which beams of light and a photo-electric cell are employed to produce music, comes into general use. This mechanism was developed by Professor Arthur C. Hardy and Sherwood F. Brown, of the Department of Physics at the Massachusetts Institute of Technology. The idea was originated by Mr. du Val R. Goldthwaite. Mr. Goldthwaite's plan was to produce synthetical musical sounds which have never been heard before.

The instrument operates by a glass disk, on which are recorded, photographically, a number of concentric sound tracks. The disk is rotated rapidly in front of a photo-electric cell and light from a small lamp is allowed to pass through the sound tracks. The current produced by the photo-electric cell is amplified and fed to a loud speaker. Individual sound tracks are cut off by shutters, which are electrically operated from the keyboard by the performer.

## Smallest Practical Plane Flies East

IN what is considered to be the smallest practical powered glider, Stanley Huffman made a non-stop flight from Cincinnati to New York in 10 hours and 10 minutes. This glider is powered with a small two-cylinder gasoline engine. It is not snapped into the air by a rubber cord, as the regular gliders are, but will take off from the ground by its own power. A flying speed of about sixty miles an hour can be obtained. The landing speed is only twenty-five miles an hour. The photograph below shows Huffman landing at New York after completing his non-stop flight.

It is said in aviation circles that one will see many of these powered gliders in the near future. Perhaps glider enthusiasts may soon be able to purchase outboard motors for their gliders!



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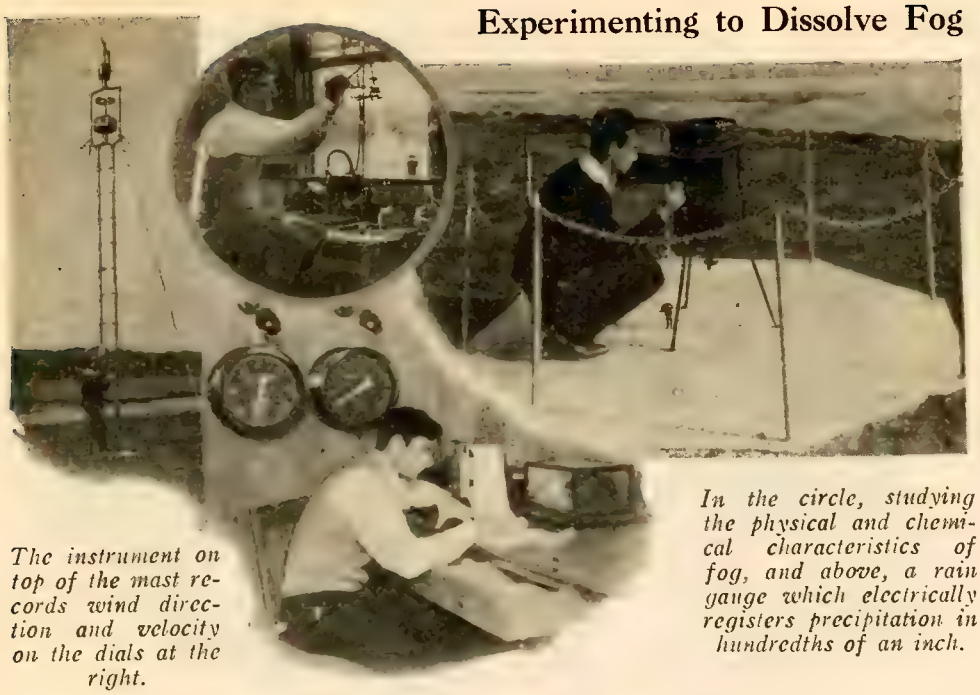
## Experimenting to Dissolve Fog



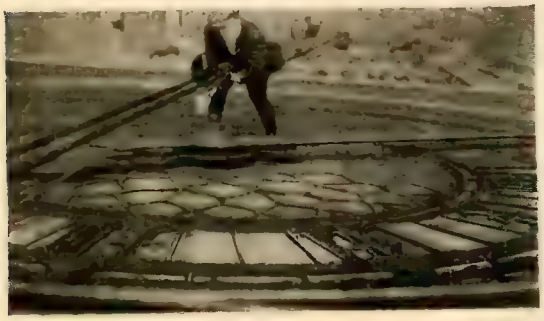
*The instrument on top of the mast records wind direction and velocity on the dials at the right.*

*In the circle, studying the physical and chemical characteristics of fog, and above, a rain gauge which electrically registers precipitation in hundredths of an inch.*

FOG, still the greatest menace to the navigator on the seas and in the air, is being put under the microscope at the Massachusetts Institute of Technology's new Meteorological Observatory at Round Hill, Mass. Attempts will be made to forecast the approach of fog and prevent or dissolve it. The Institute has a complete weather observatory with instruments mounted on towers and connected to dials and meters in the laboratory where instant and constant observation is possible. The laboratory will seek to develop an accurate method of measuring absolute humidity. It hopes to measure separately the total amount of liquid water and vapor in the atmosphere, and the size of the droplets. Studies will be made to determine to what degree the size of the drops affect visibility.

## Big Ben Gets Its Face Cleaned

THE world's most famous clock, Big Ben, of Westminster, has to have its face cleaned regularly. This work is generally accomplished from a small seat supported by a cable, which hangs from the top of the building. The face of Big Ben is 182 feet above the roadway and is much larger than most Londoners think. The photograph shows Mr. Larkins, a famous London steeple-jack, about to start the wash as he swings in a frail cradle face to face with Big Ben. The picture was taken from the top of the structure.



## Maggots for Treating Bone Diseases

EXPERIMENTS are now being conducted along the lines of the Baer method of treating osteomyelitis with maggots, tiny larvae of flies. During the war, Dr. William S. Baer noticed that wounded soldiers who had been lying in the fields for hours were brought in with their wounds covered by tiny crawling maggots, which are the larvae from which common flies develop. These men, strangely enough, did not develop infections in their wounds, as did those whose wounds had been dressed and treated soon after infliction. Now maggots are being bred free from germs and are being introduced at the seat of infection. They eat the dead tissues, bone and flesh, and thus destroy good breeding ground for bacteria. Excellent results have been attained with this method in the treating of osteomyelitis in children.

## Newspaper's Front Page Telegraphed Across Country

THREE hours after an edition of a San Francisco newspaper had left the presses in that city, persons in the Research Laboratory of the General Electric Company at Schenectady, 2,500 miles distant were reading the front page. It had been flashed across the country by radio and reproduced in full in the laboratory by means of a new type automatic carbon recorder.

Radio engineers here declare this is the first time such a feat has been accomplished and predict that as an ultimate outcome radio may soon be delivering a large part of business mail and may eventually bring the daily newspapers direct into the homes.

The device, no larger in size than the average suitcase, can be attached to any radio receiver, much the same as a loud speaker. It prints on a roll of paper which automatically moves through the machine at the rate of about one half inch a minute. In the experimental tests with San Francisco, a short wave receiver was used, but only because it was found more convenient so that tests would not interfere with programs on any of the regular broadcast channels. In the experiments, a roll of paper eight inches wide was used, which recorded the front page in three separate strips.

WEATHER THE CALL-BULLETIN LATEST EDITION

Link Banks in $118,000,000 Julian Plot

WIFE KIDNAPED, BEATEN BY 6 MASKED MEN

4 Trapped on Rock Wait Tide

GANG IN AUTO CHOKE, ROB WOMAN

CITIES CLAIM BUSINESS ON UP GRADE

WAVES BLOCK RESCUE OF YOUTHS

BENNETT TO

SECRET PHONES PAST SOUGHT

ARRESTS SOLVE 27 ROBBERIES

FLORIS SHOOTS GUARDS, FLEE

STOCKS SAGG AS WAR ST. OPENS

SPRING WITH LAMBS, BLOOMS, LOVE HERE

*The front page of the Call Bulletin, greatly reduced, which was transmitted by radio and completely reproduced on the East Coast three hours after it left the West Coast presses.*

*Two experimenters, Dr. E. F. W. Alexanderson and Mr. Owen D. Young, standing beside the small reproducing device.*

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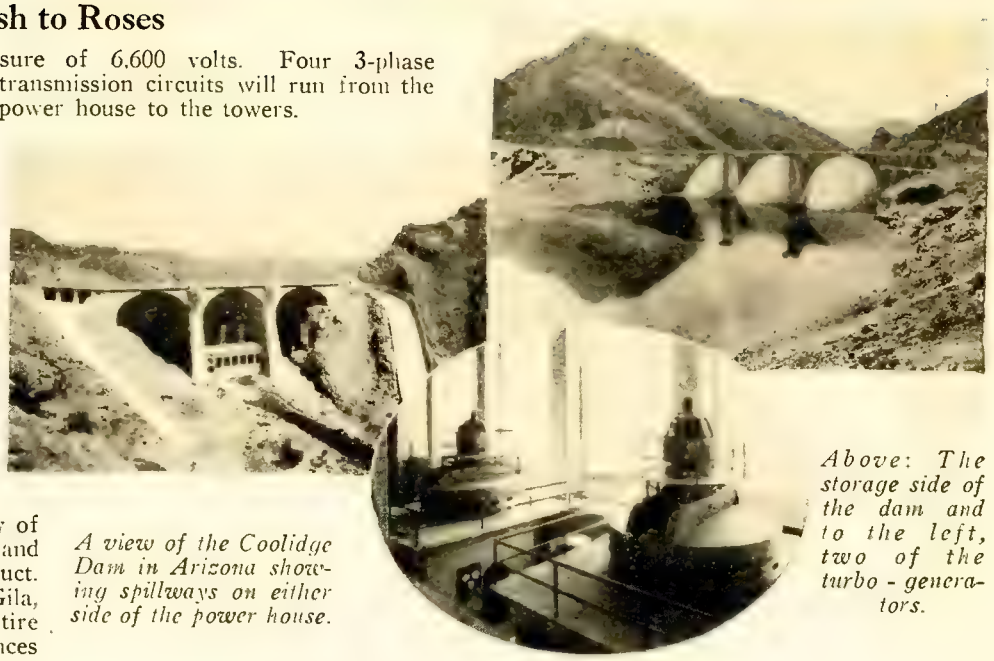
## From Sage Brush to Roses

ON March 4th, the Coolidge Dam in Arizona was officially dedicated. With this ceremony, the dreams of the settlers of the Florence-Casa Grand Valley and the Pima Indians of this former arid region, were brought to full realization. The dam was officially initiated in 1924 by Congress with an act authorizing $5,500,000 for construction. The actual work was started in 1927 and the electrical installation was completed in 1929. It is the first multiple dome type dam ever constructed, and second only to the great Roosevelt Dam in the quantity of water impounded. Situated on the Gila River, it stores a supply of water for irrigating 100,000 acres, and produces electricity as a by-product. Based on the average flow of the Gila, it will take 3½ years to fill the entire storage capacity. Electrical resistances have been built into the concrete structure of the steel-reinforced buttresses to indicate on meters any contraction or expansion. The turbines will develop 9,200 horsepower and will operate generators developing current at a pressure of 6,600 volts. Four 3-phase transmission circuits will run from the power house to the towers.



*A view of the Coolidge Dam in Arizona showing spillways on either side of the power house.*

*Above: The storage side of the dam and to the left, two of the turbo-generators.*

## A Second Trans-Neptunian Body?

THERE is a possibility that the Dominion Observatory had unwittingly discovered another unknown trans-Neptunian body and recorded this body on photographic plates fully six years ago. At the time the photograph was taken, the tiny speck on the plate was considered of little significance, if noticed at all. Dr. Meldrum Stewart, Director of the Observatory, said that as soon as word came to him of the discovery of planet X, he and his assistants instituted a search through old photographic plates and on three plates taken in 1924, they found they had recorded a hitherto unnoticed object. It is not likely that this object is the same as planet X in a previous position.

## A Lighthouse Above Roof Tops

IN Berlin, Germany, a lighthouse has been constructed on a roof top, and while it does not throw beams of light in all directions to guide ships at sea, it serves practically the same purpose for land ships; namely, the automobile. The attendants in this tower control the traffic lights of the city. From their centralized position the officials can obtain a view of the whole city. They can turn on the light to illuminate the thoroughfare as well as regulate the movement of traffic in any direction. By proper control the guardian of traffic can relieve congestion and equalize traffic flow. For a stunt like this to become effective in some of our larger cities, it would probably be necessary to resort to a captive balloon from which signals could be sent to a ground station. It is quite difficult to observe traffic movement at the base of some of our canyons, the walls of which are formed by skyscrapers. Aerial survey photographs have shown that a true idea of traffic in many of our cities can be gotten only from above.

## Power Sub-station Moves Seven Blocks Without Disrupting Service

*The world's largest power sub-station was moved from the street level to another position seven blocks away and 100 feet beneath the street level.*

*The two ton storage batteries seven feet long, two feet wide and two feet nine inches deep were placed on special wheeled trucks and hauled through an underground tunnel to the new location.*

BURIED deep in solid bedrock, 100 feet under the streets of Manhattan, in the heart of the Grand Central skyscraper zone, the world's largest power substation distributes light, heat and power to more than 60,000 persons occupying twenty-eight buildings—an area of more than 255 acres—and supplies power to over 650 trains daily.

At a cost of $3,000,000 the engineers of the New York Central Railroad Company dismantled the old street level power plant, which was a city block in area, and moved it to its present cavern-like site seven blocks away. This was done without interfering with the operation of terminals, buildings or trains.

Should the power of the sub-station break down, an 8,000 ampere standby battery containing 250 cells, each weighing more than two tons, provides full service for 25 minutes.—*J. W. Von Stein.*

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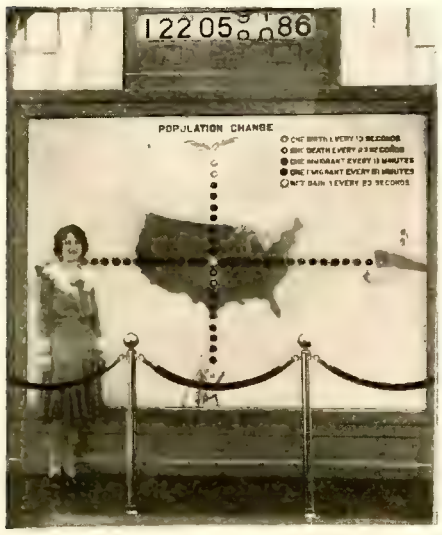
## It's a Flying Target

IN Germany, when the manufacturers of liverwurst, sauerkraut, frankfurters, or any other favorite Teutonic product wish to advertise their wares to a neck-craning, sky-gazing public, they send up an outfit like this. It's simply a piece of painted sailcloth attached by a weighted cable to the plane above. Instead of smudging the sky with smoky letters as their American brothers of advertising do, they wave the decorated banner in the air. It's supposed to be very effective. In addition it may be used as a flying target for training the embryonic aces of the Rhineland.

The size and design of the new target make it a good mark for a machine gun.

## Raise You Five!

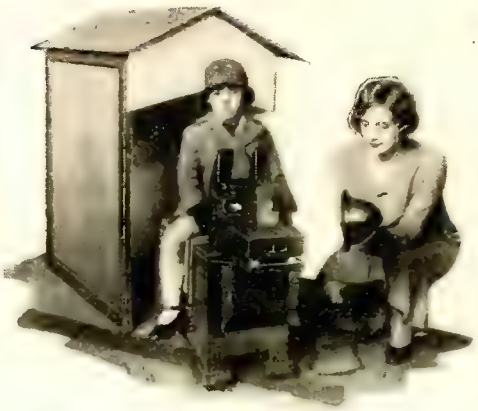
THAT'S what Bessie Sparks of the Census Bureau in Washington, D. C., could say every minute or so as this machine clicks off the records of births, deaths, immigrations, and emigrations. This is only one of the many unusual machines utilized in the obtaining and recording of the 1930 census. According to this machine there is a net gain of one person every 23 seconds to the population of our country.




## Berlin Finds That Plants Thrive on Electricity

IF you want your plants to sit up, take notice, and become virile and vigorous, give them a little electricity. In Berlin, Germany, the owner of a large hothouse found that when he heated and lighted it with electricity, his plants grew bigger and better as a result. If you notice this picture carefully you will see that he was not disappointed in his results. Note the size of the plants, as well as the string of electric lamps with high-powered bulbs. If the plants grow in this manner, we are wondering what's going to happen to the hardy unwanted weeds, which have a peculiar habit of thriving without electricity.

## "Woof, Woof!" Says Radio Dog



PHIL, the radio dog, has photo-electric eyes, relays for his vertebrae, and several amplifying tubes to operate his pedal extremities, but that doesn't prevent Phil from rolling over and playing dead when he gets tired of responding to light beams flashed across his eyes. He's got Micky the Mouse and Felix the Cat beaten all ways. He barks, wags his tail, rolls his eyes, and even answers to his name in response to a number of light flashes on his photo-electric eyes.

Phil uses electricity for food instead of tasteless dog biscuit.

## Why Does a Chicken Jerk Its Head?

WHY does a chicken jerk its head when it runs? No, it isn't a riddle. It's a psychological problem, and the answer is, so that it can see better. Contrary to all appearances, the chicken's head does not really move back and forth. The head jerks forward only. The body catches up. Then the head jerks forward again, and so on, according to Drs. Knight Dunlap and G. H. Mowrer of Johns Hopkins University, who have studied this problem in their psychological laboratory.

The obvious function of this jerking is to cut off vision during a part of the head movement. This prevents blurring and gives the chicken a succession of clear pictures. . . . When swimming, ducks and swans do not jerk the head, but the entire body moves forward smoothly. Investigations of the walking motions of water-fowls are not completed, Dr. Dunlap says, but ducks appear to have a kind of head movement which is in some respects just the opposite of the chicken's.

## Vertical Antenna for Airplanes

THE idea of stringing a radio antenna across the leading edge of the wing or supporting it immediately above the wing, or even trailing it, may be a thing of the past, if the experiments now being conducted prove as successful as first reports would have one believe. The present trend in antenna styles may give way to a short vertical tube which is erected on the fuselage near the tail. One can see this antenna in the photograph, projecting upward immediately in front of the opening in the fuselage. Should the officer in charge of the plane desire to remove the antenna, he can do so and can store it in the fuselage, pushing it through the flap-covered opening, through which a portable set can also be entered. This antenna offers very little resistance to the wind and does not vary its natural wavelength. The radio transmitter can be tuned before the plane leaves the ground, and messages can be relayed as long as the generator or storage batteries furnish the current.

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# Would You Believe It?

***A House on Stilts—A 12-pound Potato—A Tree 3½ Blocks in Circumference—An Up-side-down Animal that Carries Its Young in a Pouch, and a Lamp Shade Chime Tower Are Presented This Month***

## House on Stilts

*ON Riverside Drive in New York City a house has been built on stilts because of the peculiar ground formation. The steel stilts were covered with masonry.*

## Sweet Potato Weighs 12 Pounds

*HERE is a yam that is a yam. If you don't believe it, just note that the scales indicate a weight af a little more than 12 pounds for this giant spud. There is enough food in this giant to feed a family of 18. Miss Myrtis Lane consented to let the photographer take this picture of her and the huge sweet potato which was grown at Montabello, California. No information is obtainable as to how many yams can be produced by a single plant.*

## Up-side-down Animal Cradles Its Young

*THE flying lemur hangs to a branch in an up-side-down position. It carries its young in a pouch until such time as they can get about themselves. The lemur's natural habitat is chiefly in northern Borneo. This illustration is part of an exhibit of collections from the Crane Pacific Expedition of the Field Museum of Natural History in Chicago. It was executed by the famous portrayer of nature subjects, Walter A. Weben.*

## Old Lamp Shades Are the Chimes in a Singing Tower

*LOUIS ZWIEG, an 80-year-old veteran of the Indian wars, has constructed an ingenious singing tower from lamp shades, which act as the chimes. Raindrops falling on the roof of the water tower, in which the chimes are located, or music on the radio cause the chimes to vibrate resonantly.*

## Single Tree Has Circumference of Three Blocks

*THE largest banyan tree on record is this one in Calcutta, India, which has a circumference of nearly 3½ blocks. Feeders grow down from its branches, take root in the ground, and form many small supporting trunks for the one great tree, whose inside is a veritable forest.*

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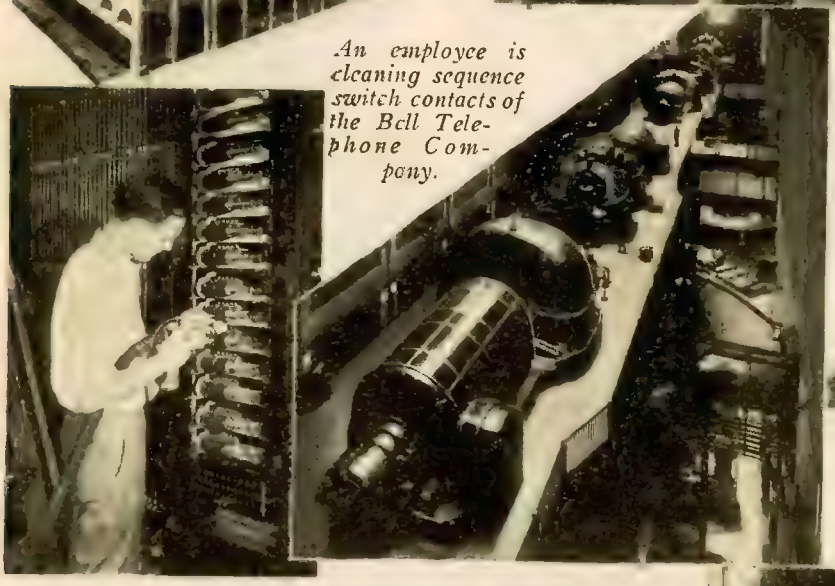
# St. Louis—

## *a Scientific Glimpse*

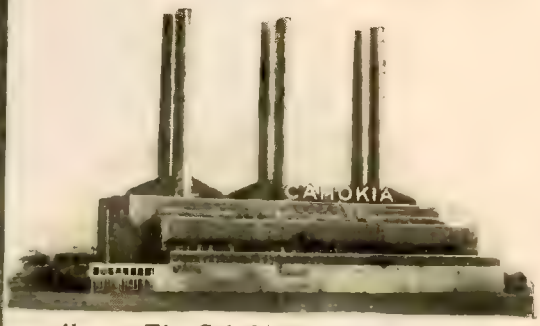
**Milwaukee, Chicago and Philadelphia Have Already Appeared in This Series . . . Next Month Cleveland Will Be Featured**

*The Bell Telephone building is 31 stories high and is the tallest in St. Louis. It is built in the modern setback style to assure maximum light and air.*

*The magnificent Eads Bridge is the greatest cast-metal arch bridge in the world. Its span is 520 feet. It crosses the Mississippi here.*

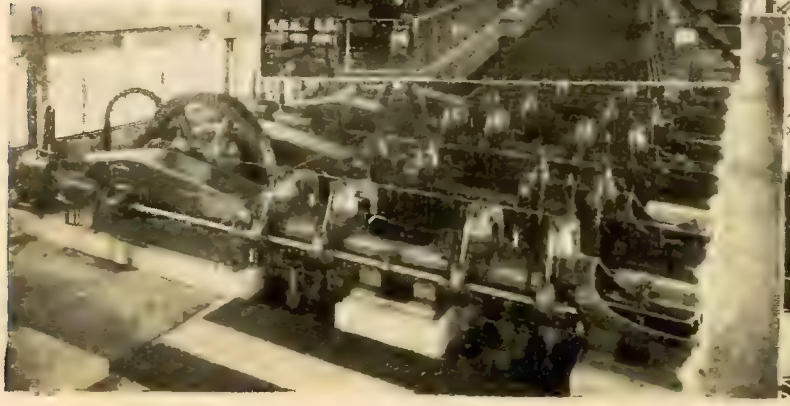


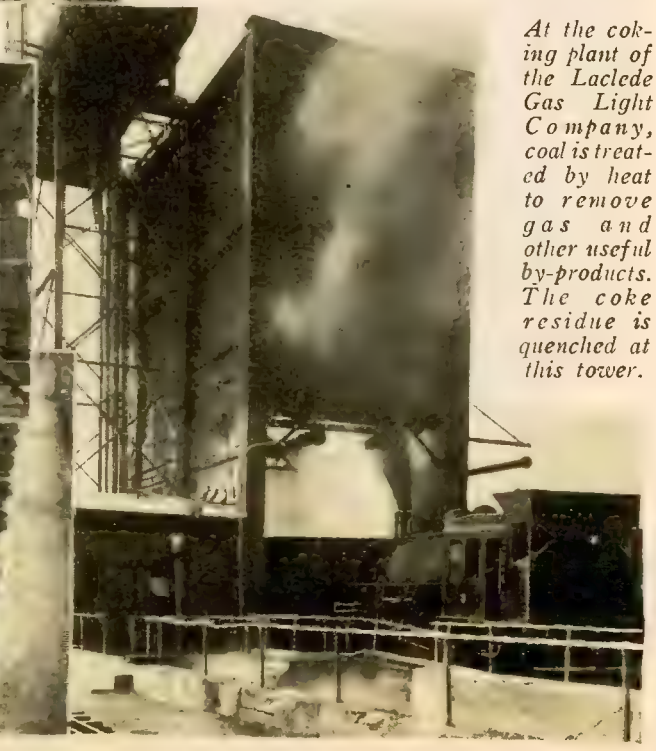
*An employee is cleaning sequence switch contacts of the Bell Telephone Company.*




*Above—The Cahokia steam-electric plant on the Mississippi supplies St. Louis with current for light and power. Left—A view of the big turbo-generator units in the Cahokia plant. Owner, Union Electric Company.*

*Right—The Union Market is built and equipped in a scientifically hygienic fashion. Below—Compressor equipment for the Mississippi River Fuel Corporation's natural gas line, which carries gas to St. Louis.*





*At the coking plant of the Laclede Gas Light Company, coal is treated by heat to remove gas and other useful by-products. The coke residue is quenched at this tower.*

All Photos Courtesy St. Louis News Service

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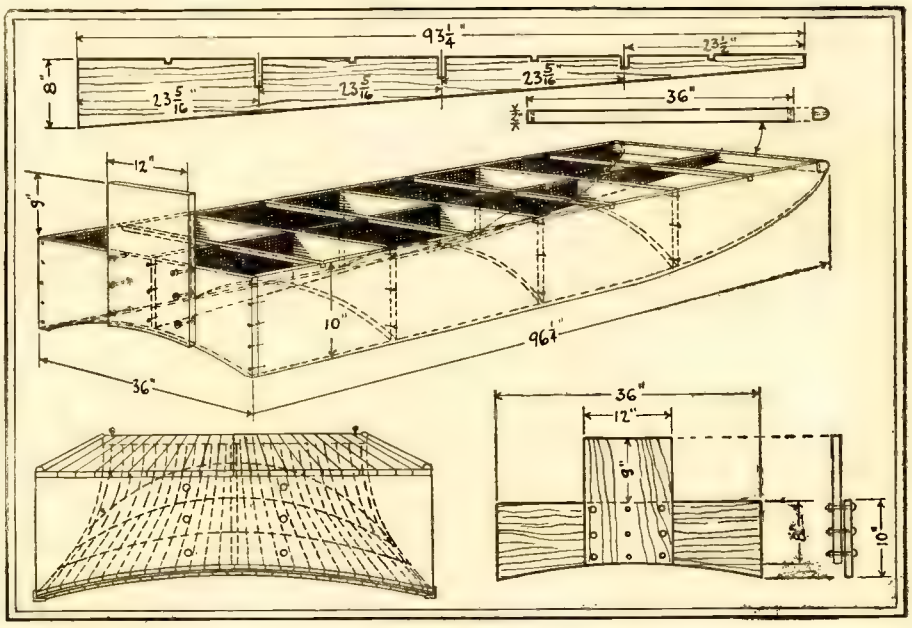
*Here's one outboard aquaplane enthusiast pictured riding the waves.*

# How to Make an Outboard Aquaplane

***If You're an Outboard Motor Fan, You'll Like This New Sport. You Can Construct the Aquaplane Easily—by Following These Plans and Details***

By Dick Cole



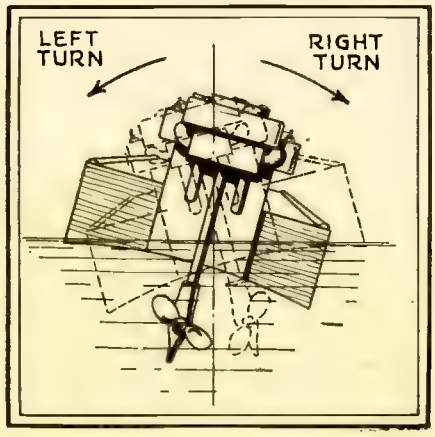

AQUAPLANING is one of the most thrilling and exhilarating sports. To be ricocheted over the surface of the water, standing on a narrow board towed by a thirty-mile-an-hour motorboat, gives the aquaplaner an exuberant thrill. Heretofore a high speed motorboat as a towing agent has been essential to aquaplaning. This has placed the full enjoyment of this vigorous sport beyond the pocket-book range of many prospective enthusiasts.

Now, thanks to the handy and versatile outboard motor, aquaplaning is within the reach of anyone who can afford a "little kicker." A little spare time, a few dollars' worth of material, and the common household tools are all that are necessary for the amateur builder to make a high-speed, outboard-driven aquaplane.

The large illustration on this page gives the prospective builder a clear insight into the frame construction. A "backbone" of strong wood—oak or ash is recommended—stretches the entire length of the frame along the center line. The cross-members interlock into the backbone as shown. Note that the backbone tapers from 8 inches at the stern to 2 inches at the front cross-member, and that the bottom of each cross-member is a section of an arc. The radii of the various arcs are given in the detail drawing on another page. The side boards are secured to the cross members with long wood-screws—brass or "monel metal" preferred. The tail board is then securely screwed to the ends of the side boards and to the backbone. The transom-board which supports the motor is shaped and drilled for bolt-holes, but it is not put permanently in place until after the structure has been canvas covered. In addition to the solid cross-members, other strips of wood—oak preferred—are stretched across to give additional support to the decking.

When the frame is complete it should be painted inside and outside with a good lead paint to prevent moisture from warping or distorting the wood.

The decking, or flooring, is of ⅜-inch by 2½-inch white pine, and it is fastened to the cross-members with copper nails or brass screws. The bottom is built up of two layers of ¼-inch strips with a layer of canvas between. After the first layer of strips is nailed in place with copper nails, the bottom is coated copiously with thick white-lead paint. The canvas is then stretched evenly in place and held with a few copper tacks. It, too, is coated with the white-lead paint. The true bottom is then nailed on. The strips will require a slight tapering and the edges will need a little beveling to make a smooth, neat job, but the exact degree of tapering and beveling can best be determined as the work progresses. Put the first strip along the center line and work toward the sides.




After the bottom strips have been nailed in place, the surplus canvas is cut away except for about a 1-in. flap. This flap is coated heavily with white-lead and folded up against the side boards and the stern board and is tacked closely with copper tacks. Sheet metal angle strips—preferably of brass—are then screwed to the bottom edges of the sides and the stern to give added protection.

The decking is covered with canvas which is held in place with half-round strips of hardwood. The canvas must be treated with water-proofing or paint. It is well to place mats of corrugated rubber on the deck to afford a surer foothold to the aquaplane rider. A rope is fastened (*Continued on page* 278)

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# How *to* Build *a* Scout

By Lieutenant H. A. Reynolds

*HERR MARTIN H. SCHEMPP*

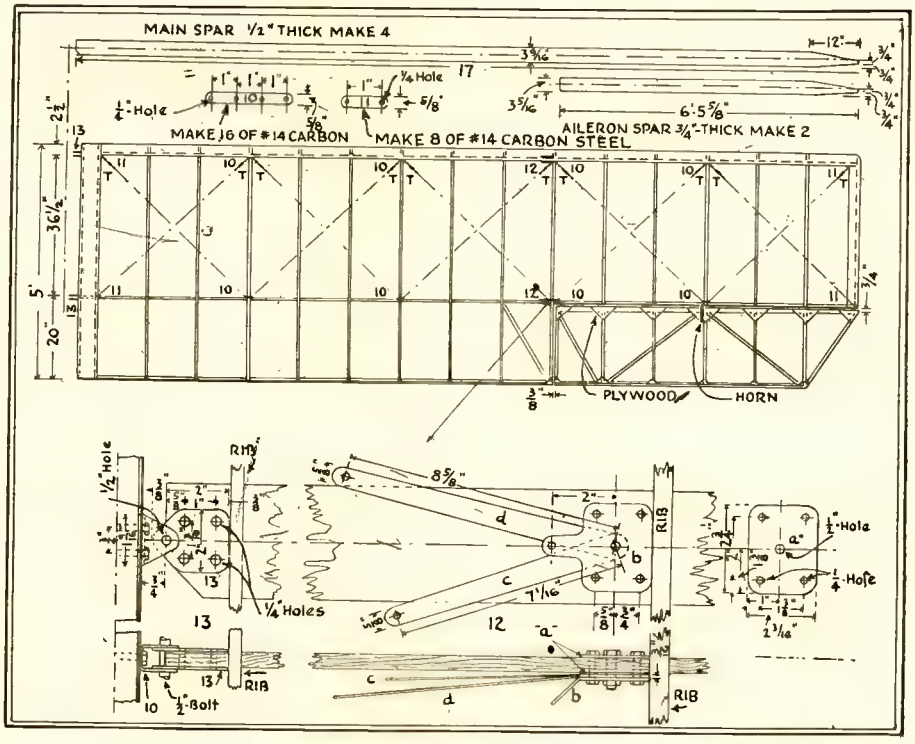
*Studied gliding under the famed Wolf Hirth, and after graduating from Stuttgart continued his air training until he knew powered and motorless craft from the standpoint of both manufacturing and flying. With his soaring and sport licenses in his pocket, he arrived in America. Here he joined Dr. Wolfgang Klemperer's expedition into the Alleghanies to test the first soaring ship built on our soil, took part in automobile-towed tests at Orion, Michigan, and finally rejoined the Syracuse Glider Club, which had engaged him for instructor service. . . . Readers of this magazine are getting in full the benefit of his glider knowledge in the design of the Scout Secondary Glider, which will be described in this and three following articles.*

SCIENCE AND INVENTION has already published in its pages instructions for building a primary training glider—an improved type constructed and tested by Lieutenant H. A. Reynolds, who used the Northrop glider previously described by SCIENCE AND INVENTION as a guide. The articles covering this glider will be found in the February, March, April and May issues, 1930.

Now Lieutenant Reynolds has joined Martin H. Schempp, German soaring pilot, instructor and fellow-member of Lieutenant Reynolds in the Syracuse Glider Club, in building a motorless training ship of superior type—a ship with an enclosed cockpit which vastly decreases head resistance; a ship which has a far higher gliding angle—13 to 1—than any primary job; a ship in which wood is combined with steel tubing to produce a ruggedness unsurpassed by any craft in the field; and, not least, a ship in which, with favorable conditions, genuine soaring flights can be made—a 42-minute flight was made in Germany last fall with a glider of the same type.

This new craft, which has been named the Scout by its builders, truly deserves the designation secondary glider, as being between the primary and soarer types. It requires no expert manipulation as do the latter, and it is outstandingly an improvement on the former. The student pilot will find it not too sensitive to the controls, and able to withstand rough treatment.

The tail group, supported by steel tubing, will never be found twisted or wabbling. Yet its gliding angle is high. You may even soar with it. We cannot imagine a ship more accurately designed to appeal to an enterprising glider club.




THE room to be used as a workshop should have a floor space of at least fifteen by twenty feet, and should be at least eight feet high. It is very difficult to do good work in cramped quarters of smaller dimensions. A good workshop can be fitted up in a cellar or basement which has a large exit leading directly outdoors. There should be sufficient room to assemble the glider outdoors conveniently near the workshop.

### *The Right Tools*

Expensive special equipment is not required. Most of the tools needed are usually found in the kit of every handy man. The following list will cover the principal tools needed: Cross-cut Saw, Rip Saw, Plane, Hammer, Wrench, Drill Brace and Drills for same, Bit Brace and Bits for same, Hack Saw, Files, Sand Paper, Glue Pot and Glue Brush, Large and Small Wood Clamps, Strong Pliers, Screwdrivers, Square, Yardstick, Accurate Measuring Tape.

### *Materials*

It is best to remember when selecting materials that a human life depends on their quality. In the choice of the materials never say, "It may do," for the best is just good enough. Stronger materials than necessary have been avoided because of their greater weight. It is wisest to be slightly over in this respect than to have a weak member in the finished glider.

### *Selecting the Woods*

Sitka spruce of United States Government specifications is always the best. A good grade of stock spruce, thoroughly dry and free from knots, is permissible if it is examined and selected with a straight grain that runs through the length. The grain should not turn out to the edge at any point along the spruce member. It is always best to order the wood from an airplane wood supply company.

*The Reynolds primary glider is still being used by the Syracuse Glider Club.*

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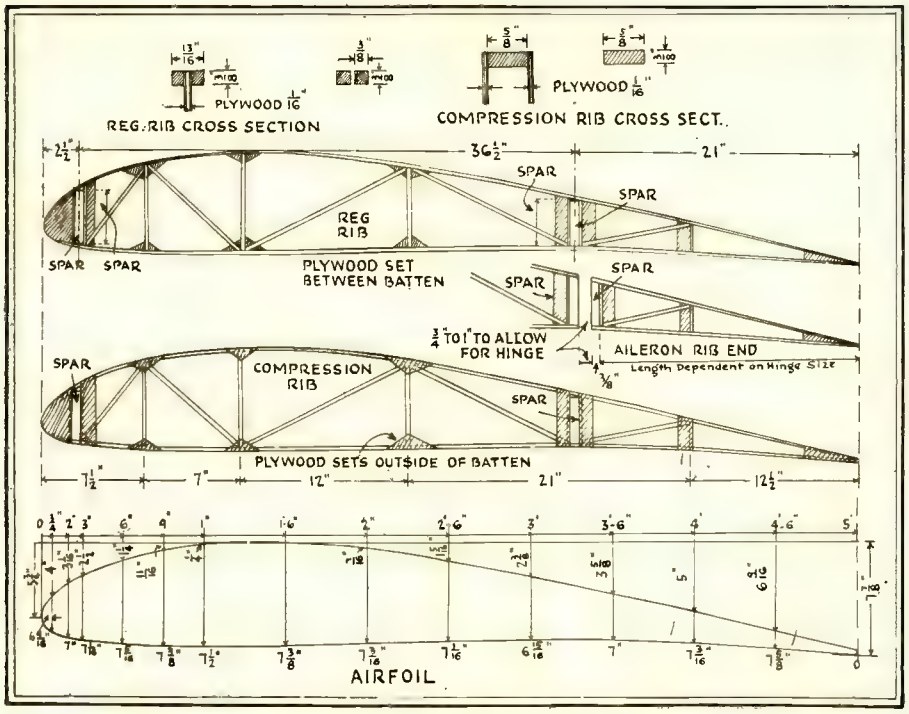
# Secondary Glider

and Herr Martin H. Schempp




*Above is a cross-sectional plan of the SCOUT Wing, with details of regular and compression ribs. At the left the general wing plan is shown, with spars and fittings. . . . The numbers appearing in the drawing are explained both in the text and in the material list on page 277.*

The plywood should be waterproof birch, three-ply. It can be purchased from airplane supply companies in the different thicknesses specified.

All bolts, screws, and nuts must be made of steel and should be purchased from a reliable airplane supply company to be sure to secure the proper material. The saying, "Any bolt will do," does not hold true in building gliders.

### *The Rib Form or Jig*

It is first necessary to make a jig in which to build up the ribs. The exact outline of the airfoil must be preserved in all of the ribs in order to get full advantage of its shape. Procure two perfectly smooth pine boards ½"x10"x6' and glue them together under the compression of several wood clamps. When the glue is dry you will have a two-ply non-warping 1"x10"x6' jig base. Use the datum line which runs along the top of the airfoil layout as a base from which to determine your reference points and draw a picture of the airfoil outline on the smooth surface of the jig base. Next draw the position of each upright and diagonal rib bracing strip. You now have a picture of the rib formation showing its internal bridge construction and the openings for the front and rear spars. It is important to have the spar openings in the exact positions shown in the rib lay-out drawing. Now drive No. 6 penny nails, the heads of which have been clipped off, along all the outlines so that when the ⅜" spruce strips are shoved down between them they will lie upon the drawing exactly matching its curves and contours. In placing the forming nails leave room for the plywood gusset plates which are inserted at all connection points of the rib framework. With a few simple alterations this one jig can be used to form and build up all the ribs needed for the glider.

*Lieutenant H. A. Reynolds in the primary glider described in SCIENCE AND INVENTION.*

There are twelve regular ribs built up as shown in the regular rib drawing. Eight regular aileron ribs are also needed. These ribs are constructed the same as the regular ribs with the exception of space for the aileron spar which is clearly shown in the aileron rib end drawing.

### *Making the Ribs*

About 160 spruce strips are cut ⅜"x⅜"x6'. These strips must be sanded to insure a sufficient surface for gluing. The long top and bottom strips are fitted between the rows of guide nails in the jig. All of the upright and diagonal strips are carefully cut and fitted into their respective places. Triangular and rectangular 1/16" three play birch plywood gussets are cut and set temporarily in their respective places at the spruce strip junctions. The position and shape of each gusset is shown in the regular rib drawing. Now a second of ⅜"x⅜" spruce strips are cut and fitted into the jig so that in form you have two thin spruce ribs with plywood gussets between them at all the junction points. The pointed trailing edge formed by the top and bottom spruce strips must be cut so that the ⅛"x¾" flange of the trailing edge can be slipped in between them. After all of the spruce and plywood members of the rib are accurately cut and tightly fitted they are taken out of the jig and placed in orderly rows so that they can be readily assembled again.

Before starting the final assembly of the rib a quantity of good waterproof glue should be provided ready for application. Caseine glue is mixed with cold water and should consist of one-half water and one-half glue. This mixture should be stirred well for (*Continued on page 276*)

***LIEUTENANT H. A. REYNOLDS***

*Is an officer in the 368th Field Artillery and during the war was stationed at the Fire School, Fort Sill, Oklahoma. Previous to that event he had experimented with a biplane glider of the suspension type, and since his return to civil life he has spent his spare time in building gliding ships of the modern variety. The first glider used by the Syracuse, N. Y., Glider Club was built by him, and the machine, after much wear and tear, is still in good flying condition. Lieutenant Reynolds is connected with a Syracuse firm in the capacity of optician, and has the use of a modern woodworking shop owned by his father for carrying out his ventures in glider construction. The Syracuse Club now has its own plant for building gliders for the instruction and use of its members. It is one of the most enterprising organizations of its kind in America.*

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# The way I see it—

By Murray Godwin

### *Now You See It, Now You Don't*

FOR outstanding achievement in science, the Society of Arts and Sciences has awarded a gold medal to Dr. Gilbert N. Lewis of the University of California. On the occasion of the presentation a paper in which Dr. Lewis set forth a revolutionary theory of time was read to the assembled scientific multitude. . . . The gist of the Lewis theory seems to be that time flows in two directions, forward and backward; that the present is the product not only of the past but of the future; that the conventional idea of cause and effect is therefore erroneous; that the universe may return some day to exactly its present condition. . . . Dr. Lewis's theory may or may not be true, but his fearless championship of this theory suggests to us that intellectual states are able to perpetuate and transfer themselves over a period of not less than fifty years. For it was at least that long ago that Dr. Friedrich Nietzsche, then residing in Europe, offered the world the same theory, as far as I can judge, with which Dr. Lewis recently crashed the front page. Without pretense of science, Nietzsche probed the idea of cause and effect and found it wanting. Still unpretending, he thought out the theory of the "eternal recurrence," which is to the effect that after going through a finite possible number of changes, the universe must undergo the selfsame cycle again, without end. . . . Nor did Dr. Nietzsche take much pride in his "revolutionary" hypothesis. On the contrary he continued to think and arrived at a number of conclusions far more remarkable for their incisive and subtle brilliance. . . . However, to date, no portion of the universal energy has taken the form of a gold medal for Dr. Nietzsche. . . . Our own view, which is to the effect that time is a convenient fiction, we still maintain. We grant time no phenomenal reality at all, and we are not constrained to applaud when someone takes advantage of its vague and intangible nature and proceeds to employ it in bewildering the natives. . . . To illustrate, Dr. Lewis's theory is supported by the fact that a man may buy a new suit today, not because his present one seemed shabby yesterday, but because he will enjoy wearing the new one tomorrow. Thus the future shapes the present, and "two-way" time is demonstrated. . . . But what if a man buys a new suit because he notices a sheik snickering at his present one and cannot get the impression out of his mind? In this case a moment of the past becomes present and remains present until the new suit is bought. To plot this in terms of time, we should have to picture the past doubling on its tracks and marching with us into the future. Therefore the idea of a two-way time would have to be discarded in favor of a time that operated in loops, zigzags, and other fantastic patterns. . . . The phoney pass in this form of entertainment, of course, is getting the audience to accept time as something definite and actual. Once that is put over, you can hand them intellectual wooden nickels until the Milky Way curdles, and get interest at ten per cent in return. However, when a man makes the pass without recognizing that it is phoney, we do not on that account think him profound. We do not think him even superficial.

### *Bobby's Motor Helps*

THE English Metropolitan Police have lengthened their reach to help keep England's highways free of congestion. When motor accidents cripple cars, police utility vans, equipped with motor repair outfits, rush to the scene. First the police crew clears the right-of-way of wreckage or disabled cars. Then the latter, if any, are set going again if possible. . . . In any case the highway is cleared for the normal traffic flow. . . . In so far as we have observed, our own police are far more devoted to putting erring motorists in their place than to helping them. When a police truck appears in an American city, it is for the purpose of towing cars wrongly parked to the pound. In fact, so thoroughly do we accept the idea that a policeman's function is to enforce the law in the most graceless fashion possible, that a policeman who is helpful and amiable on traffic duty often is swamped with gifts by grateful drivers. . . . Another point—the hardboiled American emphasis on law enforcement is paralleled by a savage disregard for the law; while the English police idea of helpfulness and protection toward the citizenry is paralleled by a thoroughgoing respect for both the law and those who represent it. To the naked eye, the policy of treating them rough seems logically certain to inspire fear of transgression. Yet transgressors flourish on our soil. On the other hand, the English policy of treating them decently even at the cost of being treated roughly oneself appears to put the misdoer at a disadvantage. The English bobby, schooled, disciplined, and unbribed, gets results with his baton which are beyond the reach of an American policeman with a sub-machine-gun. . . . Not that there is any lesson in this for our police authorities. Stupidity and brutality perpetuate themselves with a vigor that resists to the last ditch. When scientific policing really comes into its own in this country, it will do so simply because there is no other choice save absolute demoralization and chaos.

### *Submerged*

MARRIAGE by telephone is a wellworn avenue to a boxed-in news dispatch in a high percentage of the nation's daily papers. Marriage in a motor car, it seems to us, has been given several tries. In fact, from our observation of such matters, we are sure it has been. Still more certain, if anything, are we that a good many young couples have been hitched while kiting along behind a roaring motor in an airplane. We had the opportunity to witness one of these flying hitches, from the ground, about two years ago, and watched with considerable interest while the bride sent her bouquet sailing down to her wellwishers in a parachute. . . . And now a Los Angeles pair crashes the news columns and the rotogravure sections by combining matrimony and immersion and getting fitted out with double harness on the ground floor of a tank filled with water. Bride, bridegroom, and minister were attired in diving hoods, and carried on the exchange of ceremonial pleasantries through microphones with which the hoods were equipped. All in all, the exhibition served to call attention in a novel way to the efficiency of modern diving apparatus. We hope the matrimonial bark of the demonstrators, which naturally is a submarine, will never be sunk.

### *Our Part in Gliding*

GLIDING, we think, is destined to become vastly more popular as a sport and as a means of training plane pilots than it has become thus far. This despite, or rather without regard to, the prophecies of the wiseacres who have been busy calling it a flash-in-the-pan activity. The fact is that gliding is exhilarating and useful, and therefore can't fail to flourish. Added to this, it's susceptible to far higher development, both in technique and nature. . . . We mean that even the marvelous performances of soaring ships don't necessarily mark the limit of gliding potential. As one of our contributors has the intelligence to suggest, it is not impossible that a gliding ship may be developed which may rise without a shock cord and soar with an efficiency that will render it nearly equal in aerobility to the motored ships of the present day. . . . And all without a cent's outlay for gas or engine or motor repairs.

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# Stepping Ahead *with* Outboards

***Rapid Strides Are Being Made in the Field of Outboard Motorboat Racing with Scientific Equipment to Aid the Outboard Enthusiast to Get the Best from His Small Craft***

## All-Aluminum Speedboat

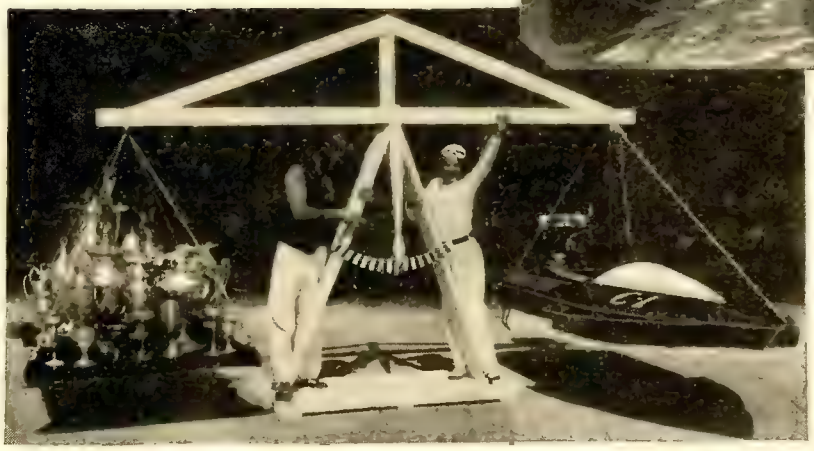
WE have heard of all-metal boats, and many of us have already seen the all-metal outboard type motorboats. These are generally of galvanized iron and heavier than the novel all-aluminum outboard motorboat to be used in an attempt to break the world speed record, and shown in the photo above. The construction here is of aluminum mounted on a wood framework. The boat is stepped for aiding and attaining greater speeds and is provided with a fin located midway in the forward step. We may hear more about this aluminum wonder if it establishes the international record.

## Speeding to Nowhere

WHILE preparing for the annual Los Angeles National Motorboat Show, fast-stepping motorboats registered their pulling power on the dials of large scales to which they were attached by a cable. By this apparatus carburetor regulations could be changed to give best results and the driver could locate his best position. A temporary laboratory of marine dynamics was constructed at the Ambassador Pool.

## Worth Its Weight in Gold

*The world champion outboard racing skiff exactly balances a huge collection of trophies and cups that it has won in competition. Dr. Leo M. Baughman, of Los Angeles, the owner, is checking the weight of boat (225 pounds) against the trophies.*

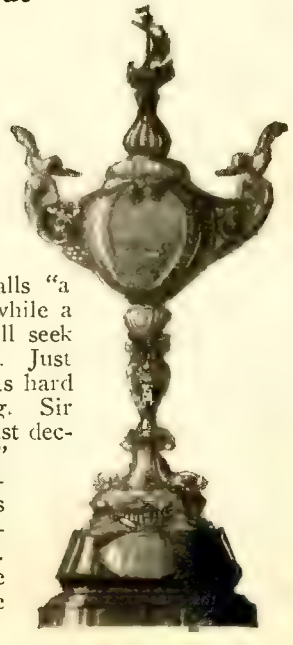


## An Outboard Steeplechase

SKIPPING the surf in his tiny Ludington-built "Flash," powered with a Johnson motor, J. E. Wilkinson of Boston, Mass., slid into the home stretch at the New York Yacht Club in the Albany-to-New York outboard race and established a new record of 3:25:03 for 133 miles. The race was broadcast from the plane "Pilot Radio" by Zeh Bouck and Arthur H. Lynch of Experimenter Publications, Inc., to a motorboat below, from which was Clifford B. Himoe of the De Forest Radio Co., relayed the code broadcast to Jersey City, N. J., where it was rebroadcast as telephonic messages over station W2XCD, and described in the New York *Times* and the New York *World*.

## Magnificent Cup for Outboard Races

HERE is something for the outboard motorboat enthusiasts to compete for—a magnificent cup that is to be awarded the winner of the West Palm Beach, Florida, races. The cup is to be presented by that perennial sportsman, Sir Thomas Lipton, who tries repeatedly to take back to England what he calls "a mug." It seems to be as worth-while a trophy as the one Sir Thomas will seek for himself in the yachting regatta. Just as worth-while, but we hope not as hard to win as the trophy for yachting. Sir Thomas has been trying for the past decade or more to carry the "mug" back to "Blighty." . . . And speaking of outboard cups—don't miss reading the first article in the August SCIENCE AND INVENTION by J. Phillips Dykes, who came home with 49 out of 55 tries. See the forecast for details.



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# Scientific Aids *to* Comfort

By Ethel J. Bein

## Keep Your Vegetables Fresh and Crisp

*Here's a summer help for retaining full-flavored foods.*

LEAFY vegetables and fruits require added moisture to keep them fresh and firm. This hydrator is said to retain the natural moisture until you are ready to use your celery, apples or salad. It also restores wilted salad materials and cut fruits to their original state. . . . And it occupies but one compact sliding compartment!

## Good-Bye to Caked Powdered Sugar

WHEN you make doughnuts, cakes or cookies, it's annoying to have powdered sugar cake in damp weather, and refuse to go through your wire sieve. Here's a sifter that is said to overcome this difficulty. Take off the cover of the container and twist. Cross bars grind the sugar against the sieve and reduce the lumps to fine powder and at the same time distribute the sugar evenly.

## Triple-Service Dishes Set

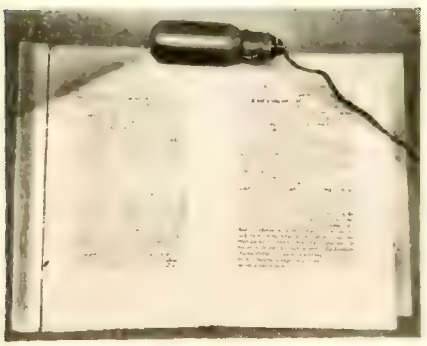
ATTRACTIVE sets of three dishes in green, blue and yellow that are said to be equally useful for storing food in the refrigerator, warming it on the stove, and serving at the table, are now available. They come assorted—6⅛×3, 6⅞×3½, and 7⅝×4 inches. The larger sizes are good for lettuce and bulky vegetables. They have flat covers and detachable wire handles.

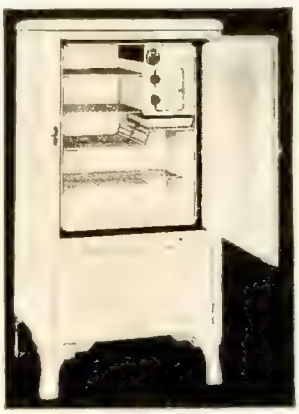
## Mountain Air to Order

IF you "roast" in your kitchen or workshop during these hot summer days, and cooking odors annoy you, connect this ozonator to a source of electric current. It is claimed to give you the equivalent of invigorating mountain air. Place it anywhere, for it is small and unobtrusive.

## Just Clip This Light On

DO you want an ideal reading lamp that can be clipped to your book? One that can be used in bed, at your radio or phone? It is excellent and costs less than $1.00 complete.





## The Latest in Refrigeration

SUMMER brings with it some much-needed refrigerators. This one is equipped with a Rollator type compressor, claimed to be superior to the usual rotary type employed in electric refrigeration. The roller turns within a cylinder, eliminating the necessity for a piston, connecting rod and other moving parts which might break. A cold accelerator adjustable to five points enables one to regulate the speed of freezing.

## The Impervious Tray

HOW would you like a tray that is not marred by hot or cold dishes, that is impervious to liquids, grease, or that bane of the housewife's existence—a lighted cigarette! We have tested this one and find it so. It is made of micarta laminations of sheet material bonded with a synthetic resin. There are seven pretty patterns in two sizes: 9½ × 12½ and 13⅝ × 17⅝ inches.

*Names and Addresses of Manufacturers on Request*

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# Does Your Home Lack Harmony?

***The Laws of Color Values, of Proportion and Balance, Function Just as Surely in Interior Decoration as They Do in the Graphic Arts***

By Mary Jacobs

W. & J. Sloane

*Here's a bedroom that has been made livable, bright and beautiful for reading and entertaining as well as sleeping. Green and yellow in soft shades predominate. The ceiling is cream, the walls yellow, the floor covered with green and white linoleum. The glass-curtains are cream, the draperies, blue-green, piped with yellow. The bedspread is green, the furniture yellow maple.*

Ward & Harvey Studios, Inc.

*This formal dining-room achieves its air of dignity largely through the size and shape of furniture, and a carefully planned color scheme. The furniture is walnut, Spanish style, and covered with dull red brocade. The dull red motif is carried through in heavy velvet draperies, table scarf and small rugs . . . Walls are rough plaster, tinted in orange, fixtures wrought iron, and the floor* ***black*** *and white marble.*

ENTER a cozy, peaceful living-room that breathes hospitality; you'll forget that you are tired. Walk into a breakfast nook whose predominating color is red; you will be cross and irritable all day. For color and furnishings create definite atmospheres, whose psychological effect is pronounced.

For what purpose is a room intended? Therein lies the keynote to its atmosphere. The hall should be dignified yet friendly; the dining-room cheerful and restful; the living-room hospitable; the bedroom airy and spacious; the kitchen compact and convenient. Color helps a good deal in achieving the proper effect. Since primitive times red has connoted fire and life; yellow the warm, bright sun; blue, peace and dignity; green, coolness; and violet, space and the distant skies. Because of their strength these pure colors appear to best advantage in small quantities; the smaller the room, the smaller the concentration. Bright red and yellow, particularly, are overpowering unless carefully used. Lesser intensities of pure colors, such as tints, shades and grayed colors, may be employed in larger quantities for walls, furniture and floors.

Tints are colors blended with white; shades, those with black; grayed colors are mixtures of pure colors and gray. Tints are usually excellent for bedrooms, because of their light color value; shades, for living-rooms, to add dignity; (*Continued on page 272*)

*A pleasing interest centers near windows. The vertical lines of the curtains, draperies and candlesticks give dignity and counteract the low, horizontal lines of the bookshelves. Plain walls of light color value increase the room's size.*

*This section of a living-room illustrates the proper balancing of heavy pieces of furniture, the placement of a rug parallel to the wall to increase its apparent length, and shows how pictures should be hung.*

Photos U. S. Bureau of Home Economics

AmericanRadioHistory.Com

# WRINKLES

### First Prize, $5.00.
### A Good Place for the Fire Extinguisher

OWNERS of many new enclosed cars believe that to attach a fire extinguisher in some handy place in the interior is to detract from the general appearance and so keep it (when an extinguisher is carried at all) under cover.

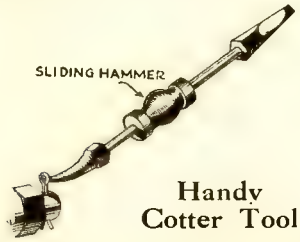
But the location shown in the photo is logical, extremely convenient, and not out of place.—*D. R. Van Horn.*

## To Tighten a Sagging Bed Spring

FIRST find the weak spot, then tighten jaws of wrench on the wire. Twist wrench to one side to put a crimp in the wire or give it a double bend. Do this where the spring is loose.—*J. E. Bauman.*

### Scorch Spots

SCORCH on white material may be removed by rubbing the place with diluted peroxide.—*E. B. M.*




### Handy Cotter Tool

THE tool shown in the sketch is easily made from tool steel and has multiple uses for extracting cotter pins and spreading them when replaced. The sliding hammer is an ideal tool for many inaccessible places. The chisel end is handy for spreading cotters and for starting flanges apart, etc.—*Charles H. Willey.*

### Book-Stand Brace

A GOOD brace, for a wide bookstand with heavy books on it, is a plain wire from top to bottom of shelf. This wire is fastened on the top of the bookstand and is securely fastened to each of the shelves through a little hole in the center of each. First, a strip or small board is placed edgewise on top of the bookstand. The dimensions of this piece of wood (or steel) vary with the size of the bookstand. Then, the wire is fastened to this piece preferably standing upright, and likewise to each of the shelves.

This arrangement prevents bookshelves holding heavy burdens from sagging in the center. The wire may be secured in the holes in the shelves by wooden tapered plugs.—*Herman J. Wavers.*

### To Keep Eggs Without Ice

FOR camping, yachting, etc., a good method of keeping eggs is as follows: Put perfectly fresh eggs, a dozen or more at a time, into a wire basket, and immerse them in boiling water containing about 5 pounds of common brown sugar per gallon of water. Place the eggs immediately after on trays to dry. This forms a thin skin next the inner surface of the shell and closes all the pores of the eggs.

Now pack the cool eggs, small end down, in a mixture of one part finely powdered charcoal to two parts of dry bran. They will keep 5 to 10 months.—*L. C. Hartzog.*

**$5.00**

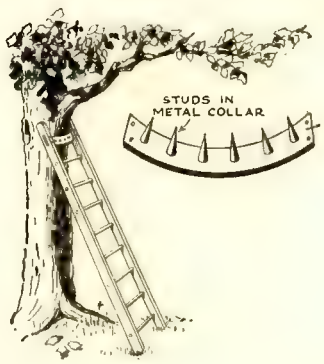
**will be paid each month for the best wrinkle or recipe submitted to the editors and which they accept and publish in these columns. All other ideas accepted and published in this department will be paid for at regular rates. Address your ideas to—*Editor Wrinkles and Recipes.***

### Waterproofing Fabrics

OLD tents, etc., can be waterproofed by brushing with the following formula. In a large pail dissolve 4 ounces of petrolatum and ½ an ounce of beeswax in 1¼ gallons of gasoline and 1 gallon of kerosene. Six ounces of tallow and 2 ounces of cod oil can be substituted for the petrolatum and the beeswax. If this mixture settles, warm in a larger pail of hot water and stir thoroughly and when mixed, brush it on the fabric. Be sure to keep open flames far away from this mixture for it is very inflammable.—*H. Bade.*

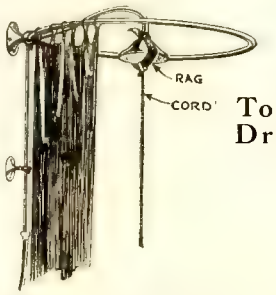
### Studded Collar Steadies Ladder

COMMON ladders are often unsafe when used in climbing trees or posts. I made a curved leather collar, mounted it between the ladder sides on top, and fitted it with a few studs to grasp the wood. This collar made my ladder entirely safe when leaned against a pole, as it prevented the ladder from sliding.—*August Jeffers.*




### Temporary Bed for Baby

A BUREAU drawer makes a good bed for a small baby if he has to be away from home over night.—*E. B. McNaughton.*




### To Silence the Drip-Drip of Water

WHEN the shower bath spray over the bathtub sprung a leak and caused a steady, nerve-racking drip-drip of water during the dead of night, the noise was silenced by tying a rag over the spray end of the shower. This rag caught the drops of water. From the rag was suspended a water-saturated string which led to the bottom of the bathtub. The wet string acted as a wick and, aided by gravitation, carried the drops of water noiselessly to the bottom of the tub. Use this improvised idea until a new washer is installed in the shower faucet.—*Ray J. Marran.*

### Curtain Pole Rings Slide Freely

WOOD rings on wood curtain poles have a tendency to stick when pulled to one side, especially if the equipment is newly varnished. By rubbing Castile soap or a parafin candle along the top of the pole the rings will move readily. The soap is not as permanent as candle wax.—*Hi Sibley.*

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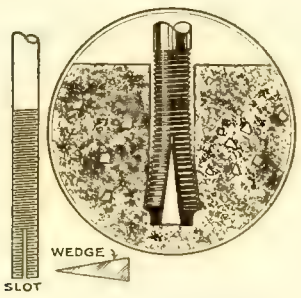
# *and* RECIPES

## A Handy Fastener

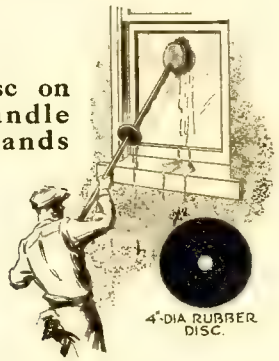
IF you forget to put a bolt in your concrete to fasten the sill down on a small building, take a star drill or any kind of drill and drill a hole in the concrete. Then take a bolt the size and length you want it and cut off the head. With a hack saw split it about two inches and insert wedge and drive down tight. Fill with thin cement.—*A. E. Carroll.*




## Pin Holes in Hot Water Tanks

HOT water tanks, even when comparatively new, sometimes develop pin holes. These can be quickly and securely repaired by inserting screws into the holes.—*O. A. Trapp.*

## Rubber Disc on Brush Handle Keeps Hands Dry




WHEN cleaning large shop windows with a long-handled brush, the worker found that the water drained from the mop or brush and, running down the brush handles, wetted his hands and coat sleeves. To prevent this, he fitted a disc of thin rubber over the upper part of the handle. This disc deflected the water from the handle, as shown in the illustration, and protected the operative's hands and garments. Instead of running down the brush handle, the water now ran off the edge of the rubber disc.

The disc can be readily cut from a piece of inner tube and should have a diameter of around 4". In the center a hole is cut to be a tight fit over the brush handle. This kink is particularly valuable when cleaning windows, woodwork, etc., with lye solution, which would affect the worker's hands. A similar appliance is used on double bladed canoe paddles.—*C. A. Oldroyd.*

## Writing on Glass

AN ink for writing on glass can easily be made with the aid of shellac. Dissolve some flake shellac in a solution of denatured alcohol, and then dissolve some borax in water and mix the two liquids. The shellac solution will become dark. It is still further darkened by the addition of dye or a fragment of an indelible pencil. Apply the ink with a small brush or wide pointed pen. The glass will receive this ink perfectly and it will dry to a sort of a frosted or ground glass effect.

The ink or writing can be removed by vigorous rubbing with a moist rag. —*H. Bade.*

**Two New Contests**

**No. 1—$15.00 in Prizes for Home Workshop Photographs.**

**No. 2—$55.00 in Prizes for Photographs and Detail Drawings of Things You Can Make.**

**EVERY MONTH**

**Rules on Page 243**

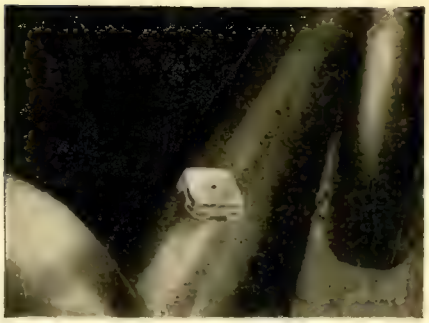
## To Reset Knives

KNIVES sometimes become loose in their handles. These can be easily cemented in again by powdering rosin and adding a small quantity of precipitated chalk and melting the mixture, pouring it into the knife handle or filling the handle with the powdered stuff. In the first case the tang of the knife is slightly warmed and forced into the handle, in the latter case it is heated quite strongly, the blade being kept cool with a wet rag wrapped around it, and the tang is inserted into the powder. This will melt the powder and the knife when cold will be firmly cemented in place.—*H. Bade.*

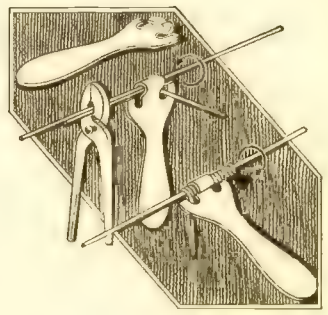
## For Notching Tin Accurately

EVERY home workshop has more or less tin work to do and very often it is necessary to cut notches. In such a case you must either stop to measure the depth of the cut or just guess at it. To facilitate this work I found that by ruling one of the tin snip blades by filing notches at intervals of 1/16, ⅛, ¼, ½, etc. inches along the entire length of the blade, much time was saved and more accurate work was possible.—*L. H. Farance.*

## Emergency Cap for Gasoline Tank



WHEN the cap on the gas tank of an automobile was lost an emergency cap was fashioned from the bottom part of the square tin box in which typewriter ribbons are sold. Each of the four sides of the box was notched with two slits. The center nib was pushed in to fit tightly over the lip of the gas tank. A hole punched in the top for an air vent completed this simple job. This emergency cap kept out road dust and prevented gasoline from splashing out of the tank. It was used until an auto supply house was reached. Any small tin box will serve.—*Ray J. Marran.*



## Handy Wire Splicer

THE sketches show how the handy man may very easily splice wire with the aid of a simple home-made tool that the writer designed. It is used in connection with a pair of ordinary pliers as illustrated, two parts being held in the plier jaws and then the tool placed and the wire end bent over the notch of the splicer. Next the tool is rotated in direction of arrow while the pliers are held stationary. The other end of splice is made as shown.—*Charles H. Willey.*

## Holder for Swab

I HAVE found that a small test tube attached to the side of the iodine or mercurochome bottle, by means of a few strips of adhesive tape, makes a very handy holder for a swab or applicator. A bottle so arranged makes a welcome addition to the medicine cabinet. —*C. B. Suter.*

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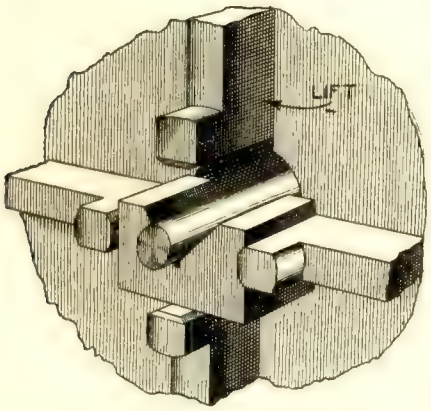
# Try These in Your Own Workshop

## *Here Are Many Valuable Hints and Suggestions for the Home Workshop Enthusiast*

### Centering Device for Lathe Chuck

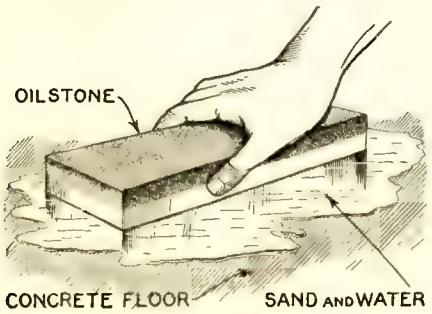
FOR reseating valve spindles, accurate turning, or boring on small diameter work where self-centering chucks are not available, or not true enough, here is a device which will obviate any trouble. The block requires




setting for only the first piece. After obtaining the necessary accuracy, one jaw only is operated to release the work. Subsequent pieces of the same diameter are held absolutely true.—*T. Bonsall.*

### New Oil Stones from Old

YOU can make a worn-out oil stone new by the following method. Take a handful of fine sand and sprinkle it on a level piece of concrete floor. Now add sufficient water to the sand to make a thin paste, and, with a circular mo-




tion, rub the oil stone face down on the concrete. This treatment will quickly level the surface of the oil stone.—*Gordon James.*

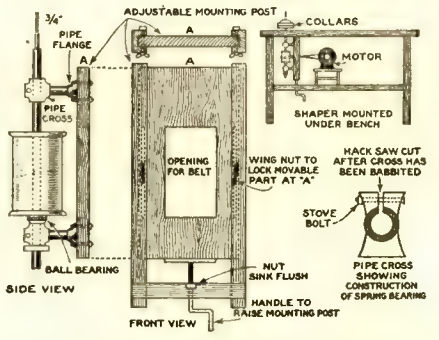
### Shaper from Odds and Ends

AN economical, accurate, and dependable wood-working shaper can be made from odds and ends by the home workshop enthusiast.

For the bearings, two flanges, two nipples, and two crosses are needed. Plug the nipples where they enter the crosses; assemble the fittings and tighten to an equal height. Bore a hole in two pieces of wood, trim to length and nail to a base. Bolt or screw the flanges to this base, and place in a vertical position in a vise. Pipe plugs in the front of the crosses and box paper clamped to the bottom will prevent the babbitt from running out. Pour the babbitt, stopping ⅛ inch from top. This space is for oil.

Remove the shaft, and drill holes through side of crosses for 3/16 inch stove bolts. Then with a hack saw cut through front of crosses and babbitt. Insert the bolts and adjust nuts. This makes an excellent spring bearing.

The pulley is made by gluing scraps of paneling together. Bore a hole through stock and insert shaft, place in bearings and clamp to bench in a horizontal position. Fasten a one and one-half inch collar to the shaft as a temporary pulley, apply power and turn




wooden pulley to correct diameter. The assembly is bolted to mounting block or post as shown in sketch. A slotted hole in the post permits the assembly to be raised and lowered by means of the crank at the bottom. The wing nuts lock it at any height. A piece of strap iron on the lower end of post prevents the crank from biting into the wood. A square hole is cut in the mounting post for the belt.

Collars to hold cutters should be two and one-half inches in diameter; but smaller ones may be used with good results.

Possible up and down play is prevented by a ½ inch washer, drilled, tapped, and fastened on the shaft under the bottom cross. A thrust ball race assembly, while not absolutely necessary, will add to smoothness of machine.

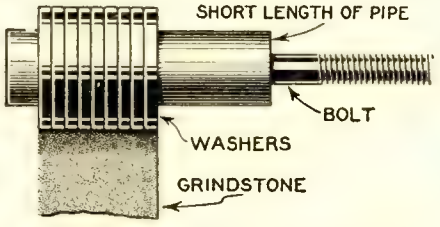
If space is lacking the shaper may be mounted under the work table or bench, and when not in use the spindle dropped flush with top.—*R. S. Glover.*

### Drilling Hardened Steel

IF the drill is not hard enough, heat it to a cherry red and plunge it into a small tube of mercury. The application of a drop of diluted hydrochloric acid on the spot to be drilled will roughen the steel enough to permit drilling. Kerosene should be used as a lubricant, and the drill kept straight, to avoid snapping.—*W. C. Wilhite.*

### Resurfacing a Grindstone

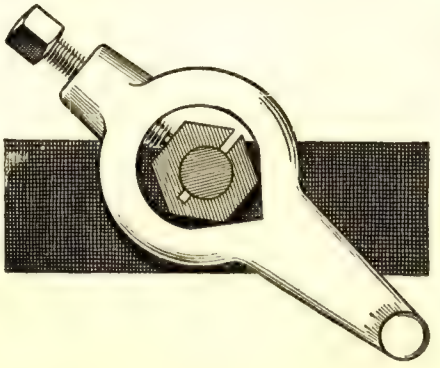
RECENTLY I could not locate the tool for refinishing my grindstone, and I used the following: It consists




of about 5 old washers, placed on a bolt about 6 inches long. A short piece of pipe about 1 inch long is placed on after the washers. This proved very satisfactory when I used it in my workshop.—*James J. Miller, Jr.*

### A Handy Addition to the Lathe Dog

THE home machinist often finds it necessary to have some means other than the ordinary lathe dog for securing a piece of work which has a threaded end. A common nut cut with a hacksaw and clamped into the dog will secure threaded work securely.—*Paul Ewaskin.*



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# *Are* You *In On These Contests?*

EVERY handiworker who reads SCIENCE AND INVENTION can get in on both of the new contests. And everyone has a chance to land one prize in the Workshop Contest and any number of prizes in the Handicraft Contest which travels tandem with it. . . . And both of them are every-month affairs.

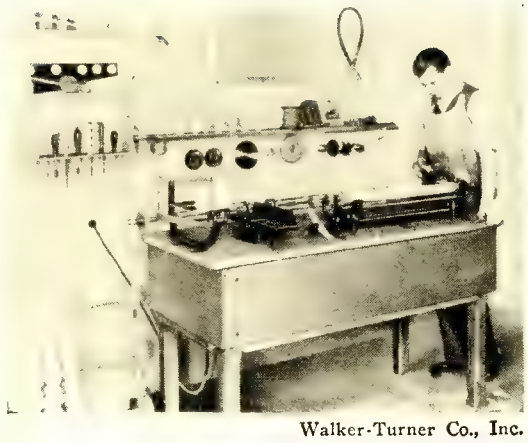
The Workshop Contest offers you a square show to collect $15 in cash for the trouble of taking a photograph of your workshop and sending it to us. . . . The Handicraft Contest offers $55 each month for sketches and detail drawings of things a handiworker can make. . . . The $55 is split four ways, beginning with $25 for first money. And what you send in can be your own favorite idea of something to make. Tell us how you do it and send in the results. We measure them against the contest conditions (see below) and if they scale up, you're in the money, hands down.

### $15.00 in Prizes for Home Workshop Photos

SCIENCE AND INVENTION will pay $15.00 monthly for the best photographs of home workshops accepted and published. There will be two awards—a first prize of $10.00 and a second of $5.00.

Conditions of the contest:

**1. The workshop must belong to the contestant submitting the photograph.**



Walker-Turner Co., Inc.

*An example of an ideal workshop.*

**2. Photos should be sharp and clear. Not smaller than 4 in. x 5 in. (Do not send films; glossy prints are best.)**

**3. A rough sketch of the plan of layout should be submitted, with a list of the equipment and tools.**

**4. Awards will be made on the basis of completeness, practicability, arrangement of equipment, material and tools, and compactness.**

**5. Each monthly contest will close on the 15th of the second month preceding date of publication.**

**6. The opinion of the judges will be final. In event of a tie, an award identical with prize tied for will be given each tying contestant.**

### $55.00 Monthly in Handicraft Contest

Readers of SCIENCE AND INVENTION Magazine who build things will find that this contest not only opens an avenue for the presentation of their ideas, but also offers an opportunity to gain cash awards for detailed descriptions of their handiwork. In this contest the builder can enter any article he has made. It can be built of metal, wood, cement, plaster, wall-board, or in fact any material that is suitable to construction.

The size of the object is immaterial. An article as small as a match-box stands as good a chance of winning first prize as a construction as big as a house. All items will be judged from the following stand points, the one considered best will be given first prize, next best will receive second prize, etc.:

**1. General appeal.**
**2. Originality and uniqueness.**
**3. Practicability.**
**4. Ease of construction.**

All entries must be accompanied by sketches from which we can make finished drawings.

Photographs, while not necessary, are highly desirable and will count in the judges' decision.

Address all entries to Handicraft Editor, Science and Invention. Entries must be in our hands on the 15th of the third month preceding date of publication.

The opinion of the judges will be final. In event of a tie, an award identical with the prize tied for will be given to each tying contestant.

The prizes are as follows:

**1st Prize—$25.00.**
**2nd Prize—$15.00.**
**3rd Prize—$10.00.**
**4th Prize—$5.00.**

Other entries accepted and published will be paid for at prevailing space rates.

# Make a Garden Swing

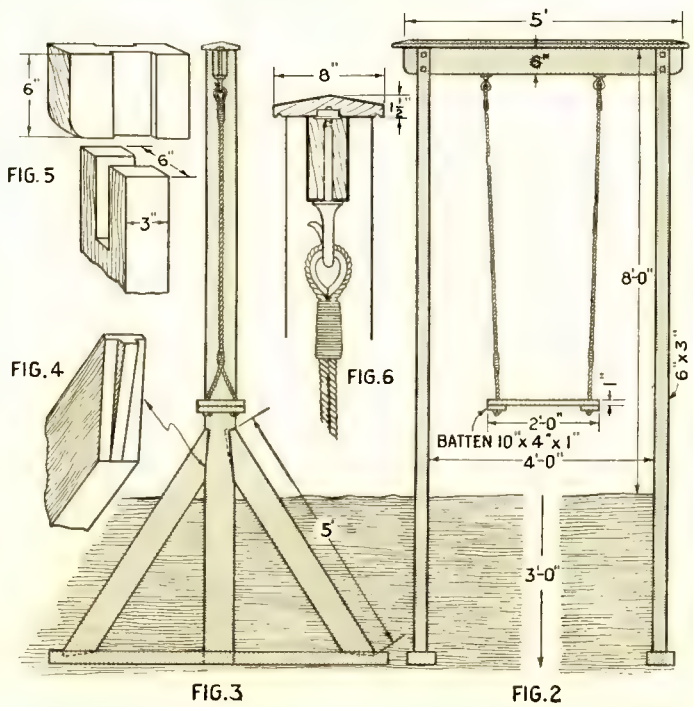
By J. E. Lovett

A GARDEN swing is one of the most easily contrived forms of amusement for the children. Room could be found for it even in a small garden, and it may be erected quite cheaply.

The swing shown in elevation and section at Figures two and three will take sixty feet of wood six inches by three inches for the frame, a five feet three inches by eight inches by one and one half inches capping piece, a two feet by ten inches by one inch seat board, and two ten inches by four inches by one inch seat battens.

The side portions of the frame should be built up first. The uprights are cut eleven feet long and are tenoned into the bearers, which are six feet long. The stays, which are framed between the uprights and bearers, are cut five feet long, and are framed in place as at Figures three and four.

The head piece is cut five feet long, and is framed to the top ends of the upright (Figure five), but before it is finally fixed it will be advisable to trench the side portions of the frame into the ground. Before the soil is returned the head-piece should be bolted to the ends of the uprights, and care should be taken to see that the uprights stand square and true.




The seat board is prepared as shown, the battens being nailed across the ends, and holes are bored through both board and battens to receive the swing rope. This should be fairly stout and may be easily arranged if a double rope is used, as in this way it will not require splicing. Two swing hooks are bored through the head-piece and iron thimbles are fitted on the rope (Figures two, three and six). This is lashed under the thimbles and again near the seat board, where it is separated and brought in single ends through the board and knotted under. The capping is nailed above the head-piece.

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# New Ideas *for the* Home Machinist

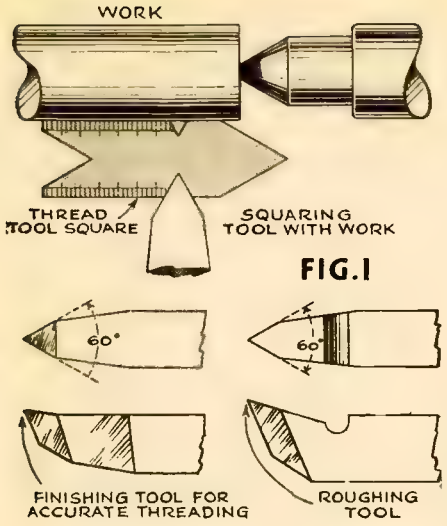

FIG. 1

## Thread-Cutting Tools

IN Fig. 1, tools are shown for the cutting of a sharp V-thread. The flat top tool on the left is for accurate finishing cuts, while the tool at the right, with clearance or rake, is for roughing cuts. These tool forms are suitable generally for cutting of threads shown by Fig. 3. When setting the job in the lathe, it is important the tool be squared with the surface of the work using a thread tool square, otherwise the most accurate tool will not cut true threads. The thread should not be cut too rapidly, but several light cuts should be made, so as to prevent roughening, which is frequently found in threads.

## A Tool for Coarse Threads

TO turn out a large heavy screw as for a jack or part requiring a coarse thread, it is preferable to use a tool shaped and set up as shown by Fig. 2.

In this, the tool is made with a wide cutting edge and is fed into the work, the compound rest having been set around to an angle of 30 degrees. The rake of the tool point permits rapid and easy cutting. When cutting iron or steel, it is necessary to use machine or lard oil for protection of the cutting edge.

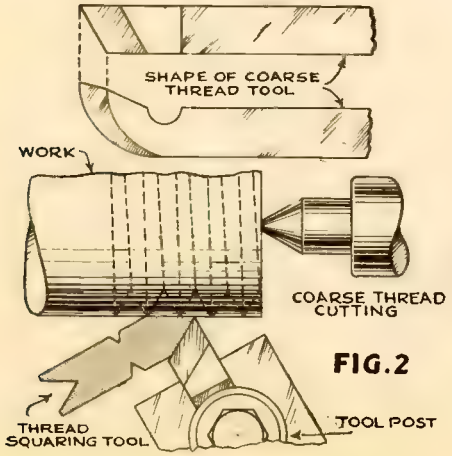

FIG. 2

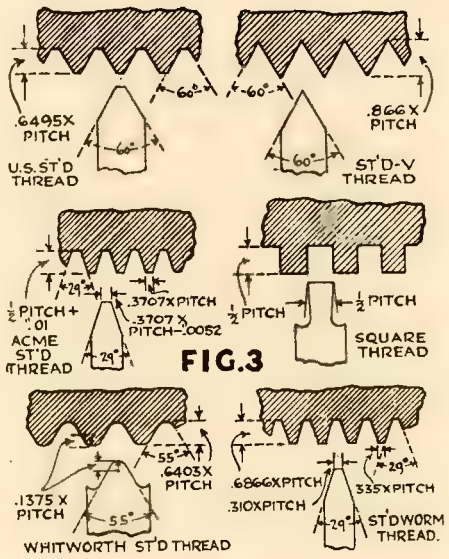

FIG. 3

## Standard Thread Forms and Tools

VARIATIONS are made in thread forms to obtain different results. In some localities a thread of one or another type may be used widely. Fig. 3 shows these various universal threads and also the proportions. The tool shape for each form, is given in a square adjacent to the thread. These shapes are suitable for most classes of work, from the ordinary screw bolt to that of thread form for worm gears. The table given should be preserved as a reference, the formula for proportions of the teeth being shown in a manner that can be easily and quickly applied.

**For Handiworkers**

**Home Workshop Enthusiasts Will Find Two Prize Contest Announcements of Much Interest to Them on Page 243 of This Issue**

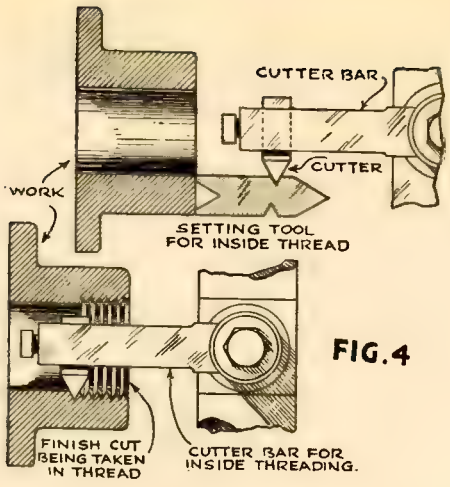

FIG. 4

## Internal Thread Cutting

CUTTING internal threads is a procedure similar to outside threading as far as handling the lathe and gearing is concerned. The hole is first bored to the root diameter of the thread.

The tool is usually made, having a holder bar with a cutter held by a set screw. The cutter is squared with the tool square, an example of which is shown in Fig. 4. The shank of the holder bar, as also shown by Fig. 4, should be large enough to be rigid, particularly if the hole is deep, requiring a long shank.

## Wire System for Measuring Threads

THE gauging of external threads is not possible with the usual calipers or micrometer alone. A three-wire system for thread gauging is shown in Fig. 5. This means is especially valuable to measure a threaded worm or other part where accuracy is desired. In Fig. 5, the formula for a V-thread is given, in which the measured distance by a micrometer will be the normal desired screw diameter, less 1.732 times the pitch plus 3 times the diameter of the wire.

The set-up for measuring with the micrometer is with three short wires of uniform diameter. Two are placed at one anvil of the micrometer and one at the other anvil.

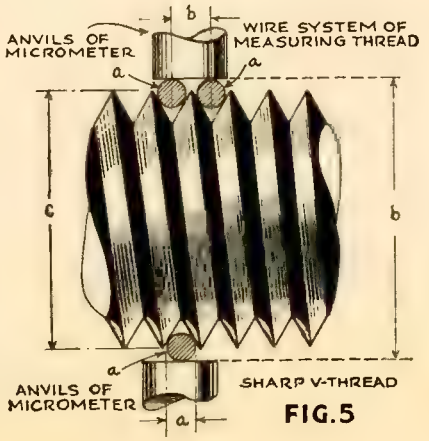

FIG. 5

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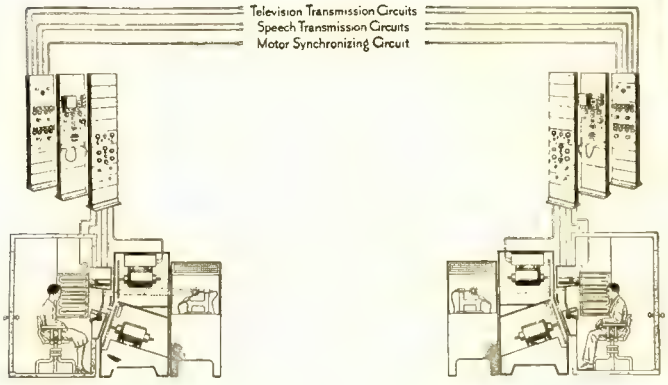
# Home Television Is Here

## *Perfection Has Not Been Achieved But Experimenters May Now Purchase Practical Radiovisors*

By Auguste Vitrel

*Improved Neon glow tube used in "Iconophone."*

DOWN in the region of the television broadcast band, which is in the extremely low wavelengths, things have been happening lately. C. Francis Jenkins has finally brought his radiovisor to the state where it may be sold as a manufactured product. Recent demonstrations from the short-wave television station W2XCR in Jersey City, N. J., have proven that it is now possible to have a home radiovisor, although the apparatus necessary is somewhat costly. In addition, the Baird Television Company has designed an instrument which has one of the finest reproductions of half-tone pictures realized to date in the field of television. Both of these systems utilize the well-known method of scanning, together with resistance-coupled amplification, Neon glow tube, photo-electric cell, and the accompanying apparatus necessary for the reception of television signals.




*The circuit hook-up used in the demonstration of the "Iconophone." At the top of the page is the Jenkins Radiovisor, with short-wave set beneath it.*

We recently sat in on the first demonstration of two-way television in the Bell Telephone Laboratories in New York City and saw the face of Joseph H. Kraus, Field Editor of SCIENCE AND INVENTION, flashed on a three-inch square screen from two miles away. This transmission was done over telephone wires and not by carrier waves. On the small screen, on which was printed the words, "Iconophone—watch here for image," we saw better detail in half-tone reproduction than we have seen before or since.

*Herbert Ives, Bell Telephone, shows his latest televisor to Walter Gifford of the American Telephone and Telegraph Company.*

*The Baird Televisor.*

The "Iconophone," as this instrument is known, is the first two-way televisor to be constructed. Its essential parts are very much similar to that of the Baird and Jenkins system, except that it has an improved Neon glow tube, more photo-electric cells, and two scanning disks. One of the disks is thirty inches in diameter (*Continued on page 263*)

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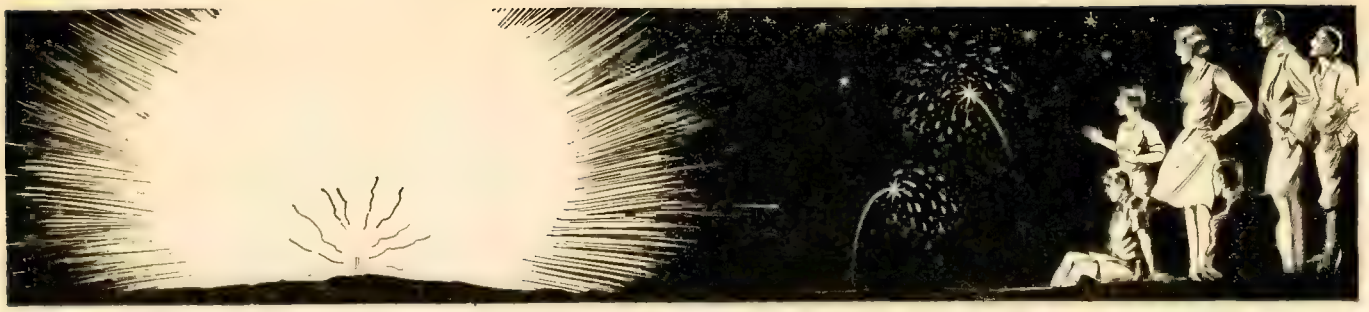


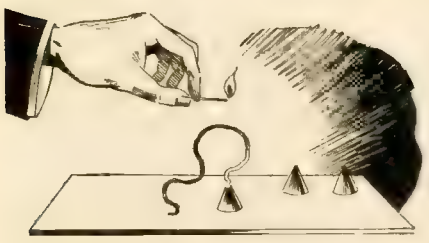
# Fireworks for the "Fourth"

## *Learn How to Make "Pharaoh's Serpents," Colored Fires, and Firework Papers. Try Them for Real Fun on the "Fourth"*

By William H. Lemkin, Ph.D.

IN the making of fireworks the chief chemical process is, of course, oxidation. There must be first some combustible substance, the rapid burning or oxidation of which produces the explosive effect of the fireworks. This is usually carbon, sulphur, or a mixture of the two. Second, there must be present an oxidizing agent, in order to get a ready and an adequate supply of oxygen. Potassium chlorate and potassium nitrate are the principal oxidizing agents employed, primarily because they are solid, easily handled and do not take on atmospheric moisture. Third, there is the active ingredient that produces the desired effect, such as a special color, brilliance, sparks, etc. There must also be present in the mixture some diluting substance which will prevent a too rapid action of the oxidizing agent. Such materials are calomel, sand, potassium sulphate and meal powder.

*Bang! goes the torpedo when it's thrown on the ground. It's only silver fulminate.*



*"Pharaoh's serpents" when placed in a pyramid and lighted will uncoil like real snakes.*

Perhaps the most spectacular branch of pyrotechnics, at least to the amateur experimenter, is that dealing with colored fires. Some remarkably thrilling effects may be obtained by the use of various salts that impart to the burning mixture a vivid red, an emerald green, or a brilliant yellow. In the preparation of such mixtures, the ingredients must first be perfectly dry. Then they must be ground up separately to a very fine powder. They are then *mixed thoroughly but very carefully on a sheet of paper, using the hands or a cardboard spatula.* The ingredient should not be rubbed together with any more force than is necessary because of the danger of spontaneous combustion. *The best method of igniting a mixture is by placing it in a small pill box resting on a plate and touching a match to it.* If it is desired to burn a larger quantity, in order to produce a protracted display, the mixture may be packed in a capsule or tube about an inch in diameter and six to twelve inches in length, made of stiff writing paper. To make the materials burn more evenly, it is best to moisten the mixture with a little alcohol, pack it down firmly in the tube by means of a wooden cylinder, and then dry. To facilitate ignition, a small quantity of the following powder, loosely twisted in thin paper, is inserted in the top:

| | |
|---|---|
| Meal powder | 16 parts |
| Potassium nitrate | 2 parts |
| Sulphur | 1 part |
| Charcoal | 1 part |

In the following formulas for colored fire mixtures, the ingredients are essentially the same, with the exception of the particular metallic salt which is added to impart the hue. Only a few representative formulas can here be given, embracing the simpler mixtures. More elaborate color schemes are obtained by combinations of various active ingredients. It might be interesting for the amateur chemical manipulator to experiment on his own hook with mixtures of the salts which impart definite colors to the burning mass.

RED

| | |
|---|---|
| Potassium nitrate | 5 parts |
| Strontium nitrate | 20 parts |
| Sulphur | 6 parts |
| Lampblack | 1 part |

YELLOW

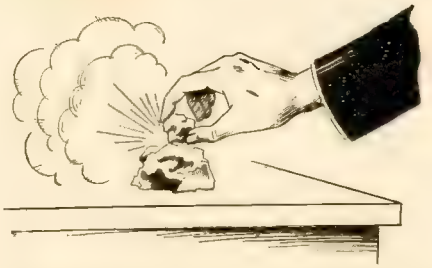
| | |
|---|---|
| Potassium chlorate | 4 parts |
| Antimony sulphide | 2 parts |
| Sulphur | 2 parts |
| Sodium oxalate | 1 part |

GREEN

| | |
|---|---|
| Barium chlorate | 2 parts |
| Barium nitrate | 3 parts |
| Sulphur | 1 part |

GOLD RAIN

| | |
|---|---|
| Sulphur | 1 part |
| Charcoal | 2 parts |
| Potassium nitrate | 4 parts |



*Silver fulminate will explode violently if placed on a piece of quartz and pressed gently. It is very dangerous.*

| | |
|---|---|
| Meal powder | 2 parts |
| Steel filings | 1 part |

RED CHINESE FIRE

| | |
|---|---|
| Sulphur | 2 parts |
| Charcoal | 2 parts |
| Potassium nitrate | 8 parts |
| Meal powder | 8 parts |
| Iron borings | 7 parts |

There is another variation in the production of colored flames which is perhaps not as vivid as the methods covered above. There are certain metallic salts that, when finely powdered, mixed with alcohol, and burned in a metal or porcelain dish, will impart to the flame their peculiar colors. These are:

(*Continued on page 264*)

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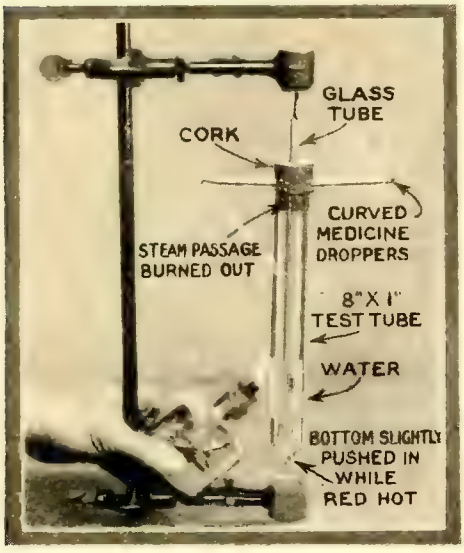
# Show Your Knowledge of Physics

## *Here Are Four More Interesting Applications of Physical Principles for Your Home Lab . . . Seven Others Are to Be Found in the June Issue*

### By Raymond B. Wailes

HERE'S a model of Hero's engine that can be made from a large test tube, two medicine droppers, a cork and a short length of glass tubing.

The body or boiler of the engine is made from an 8"x1" glass test tube. The bottom of the tube should be heated in a flame. When it has softened, the bottom should be punched in about ¼ inch with a hot nail. Do not punch *through* the glass. Let the tube cool slowly. This forms one bearing. Fix two bent or angle medicine droppers in a cork which will fit the tube as shown in the photograph. The hole can be burned with a hot nail and should run




*This model of Hero's engine will provide much fun when constructed.*

all the way through the side of the cork. Make another hole up from the small end of the cork to meet this lateral hole. Thus, steam issuing from the water contained in the test tube will pass up through the cork and issue from both the bent droppers. The top bearing is made by holding a two-inch length of ¼" glass tubing in a flame and allowing the end to close entirely. You will produce a little depression in the end of the tube in which is seated the top bearing of the engine, the bearing being a nail. The test tube rests upon another nail, pointed end up, thus giving the model engine glass-to-metal bearings.

Fill the tube half full of hot water and hold an alcohol lamp

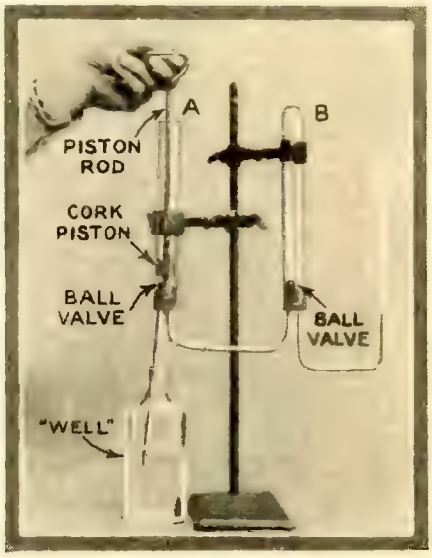
*Archimedes' screw or pump will lift water quite successfully.*

or gas flame to the side of the test tube, keeping the flame not greater than half an inch from the surface of the water. Rotate the tube slowly as steam is being gotten up, and the engine will speed merrily on in a most realistic manner. This mailing tube model of Archimedes' screw is affixed in a slanting position of about thirty degrees by means of the wire. A wire handle projects through a cork in the top of tube. At the bottom a nail, projected through the cork, acts as a bearing.

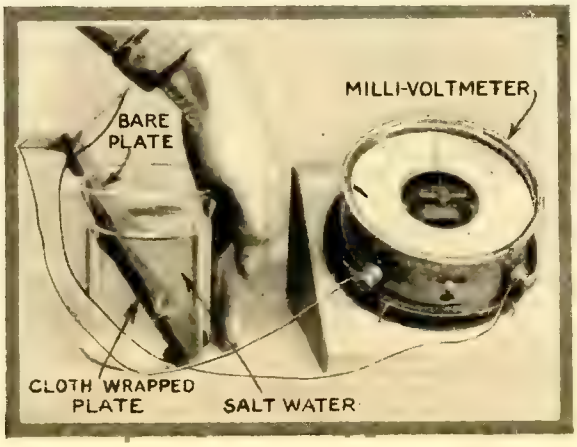
The rubber tubing is wound around the tube and held in position by means of wire loops. The lower end should dip into the water of the pan in such a manner that in one position of the tube, or "screw," water fills a short length of the rubber tube. As the tube is revolved this water always remains in the lower bend of the rubber tube and is thereby carried upward and finally falls into the receiver which can be a glass tumbler.

OBTAINING electricity from the sun is actually accomplished by this extremely simple photo-electric cell, made from two strips of sheet copper and a solution of salt in water.

The copper strips or sheets can be of any size. They are first cleaned with emery cloth and then immersed in a solution of salt water for several days. If one of the plates is then wrapped in cloth so that light will not strike its surface, and placed with the other copper strip in salt water, a current will be found to be flowing when the plates are connected to a milli-voltmeter. On shading the unwrapped, or exposed copper plate with the hand, the current flowing will be reduced, showing that the light is really causing the formation of part of the electric current.




*A simple force pump can be made with ordinary laboratory apparatus.*




*Obtaining electricity from the action of light.*

FOR the lift or "A" chamber of this pump, the closed end of an eight-inch tube should be cut off by applying a red hot nail to a file scratch at this end. A metal or wooden rod carrying a cork serves as a piston, and should slide in the tube with moderate tightness. The valve end of the "A" chamber is a cork with two holes pierced through it. One hole carries a length of glass tubing leading to the "well"—a bottle of water below it. A small clay ball rests upon this hole on the inside of the pump. The other hole connects with the closed, or force, "B" chamber, (*Continued on page 262*)

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# THE SAFETY

Conducted by

## *Readers' Opinions and Comments*

### He Won a Trophy Cup

I GOT the greatest surprise in my life when I came back from South America last week and found your beautiful cup. It looked like a million dollars. I intend to write you at great length and express my thanks in another letter, but had to get this subject off my chest. I am soon to place my model on exhibition, and wherever it appears, the cup will be standing alongside of it.

SAMUEL CRAWFORD,
Jersey City, N. J.

(*Mr. Crawford received one of* SCIENCE AND INVENTION *Magazine's model awards for the best model submitted during the month. This was an original conception of a submersible aircraft carrier to be used for military purposes. We feel sure that other model enthusiasts will feel the same way he does, should they be fortunate enough to win one of these coveted prizes.*—EDITOR.)

### Palmistry and Phrenology

IS there any scientific basis for palmistry and phrenology? The explanation and comparison made does not sound like science. I am one of your most interested readers.

CHARLES FOSSEN,
Ophir, Colo.

*(Palmistry and phrenology are merely pseudo-sciences and can be classed with the other pseudo-sciences of astrology, numerology and graphology. While it is true that you can sometimes tell at what trade a man is working by looking at his fingers and fingertips, you cannot judge his age, character, intelligence or lack of it, or reveal the past or foretell the future by lines on his hands. This publication has recorded the history of the Holland twins, in which the lines and markings of the hands of both of the lads were absolutely identical. All of the fingerprints were identical with the exception of the little finger of the right hand of one of them which showed slightly different markings from the corresponding finger on the hand of the other. Palmists do not go in for such line details as fingerprints, yet here one of the twins was an habitual criminal and the other a very successful business man.*

*The average phrenologist will tell you (and some of our foremost editorial writers are of the same opinion) that a broad forehead indicates intelligence. One of the foremost professors at Harvard University had a relatively small forehead that slanted backward at a rather acute angle. The average savage tribesman of Africa has a very high forehead and a full one at that.*—EDITOR.)

### The Singing "Sphinx"

I ENJOY reading SCIENCE AND INVENTION and especially enjoy your section on such ever-changing and interesting subjects.

I am just returning from a visit through upper and lower Egypt and in my travels through this section of the country I have not seen or heard of the hollow statue which you describe in the March edition of SCIENCE AND INVENTION.

In your section in the March edition under the title of "The Singing Sphinx," you answered Jack Smiley of Boston explaining that this statue, located in northern Egypt, emitted a whistle rather than singing and you explained that this was caused by the syphoning of water from a lower to a higher level, within a given space, in the base of the statue and the sound came from a tube in the shoulder of the statue.

I am taking exception to this explanation and believe you have in mind the northern colossus of Memnon, more commonly known as the vocal statue of Memnon, located in the ancient city of Thebes on the west bank of the Nile. The vocal statue of Memnon is well known in this section and is now a landmark which may be seen for many miles, although it no longer emits any sound. The statue is 64 feet high and about 20 feet wide. This statue was cracked in an earthquake near the time of the birth of Christ, and the sound was caused by the vibrating of the fragmentary ends, as they heated and cooled under the extreme changes of temperature of the Nile Valley.

This statue has a very interesting myth woven around it by the Egyptians of that period and created unusual interest until the time of Septimius Severus (146-211 A.D.) who caused the restoration of the upper portions, thus eliminating the sound and vibrations.

There is a very complete and interesting description and history of this statue on pages 345-346 of "Baedeker's Egypt and the Sudan," 1929 edition.

A. EWING KONOLD,
Pasadena, Calif.,
Now on board the S. S. "Adriatic".

(*The answer to the inquiry was based on information obtained from a German contemporary. The entire effect might have been a magical deception. While the ancients did develop many unique methods and applied forces in concealed ways, it is not very likely that the seated human figure known historically as the Vocal Memnon was operated in this fashion. Only two of the statues of Amenhotep III still remain. The more northern one was partially destroyed by an earthquake and the upper part thrown down. At this time a curious phenomenon took place. Every morning when the rays of the rising sun touched the statue it gave forth musical sounds like the twang of a harp string. After restoration of this statue, by Septimius Severus, the sound ceased. Desiring further information about the authenticity of the German explanation, we communicated with the Metropolitan Museum of Art of New York, and Dr. Lindsley F. Hall, of the Department of Egyptian Art, wrote:*

*"On the first part let me say that a sphinx, in Egyptian archaeology, is an image in the form of a recumbent lion, having a man's head (or sometimes a ram's), and should not be confused with a seated human figure, even though the latter be of colossal size.*

*"As to the traditional sound emitted by the colossus, we find no foundation for the explanation offered by the 'German contemporary' who supplied you with this information. It would be interesting to know who he might be, and how he arrived at his explanation. I know of no one in modern times who claims to have heard the sound, unless it were some credulous tourist taken in by a clever native.*

*The best description and data concerning the colossus of Amenhotep III at Thebes, including a paragraph on the 'Vocal Memnon,' are to be found in Baedeker's guide book on 'Egypt,' 1929 edition."*

*Should we get further information about this mystical statue, we shall be pleased to pass it along.*—EDITOR.)

### Likes the Old

AS I have a little time to spare, I thought I would write you a letter. In the first place, bear in mind that I am not a critic, nor an offender. I just wish to help and that is all.

Permit me to say that SCIENCE AND INVENTION is not what it used to be. Somehow it has changed during the last two years. I think it would be more interesting if you followed the course it took a few years ago. I have before me six copies of SCIENCE AND INVENTION. Three of them are January 1928, April 1925, July 1926. The other three are January, February and May for 1930. I really enjoy the first three more than the last three. Let me explain. Here are some articles from January 1928: Has Automaton Arrived? Why Birds Migrate, Fingerprints, Electric Watchman Guards Valuables, Fogs Menace, The Metal Emperor (story), Growing Living Chemicals, Everyday Chemistry, Hints for the Mechanic, Making an Oscillograph, Kinks for the Shop and Laboratory, Radio (several different articles on new ideas, building, hints, etc.).

From April 1925: Can We Fight Gas Attacks?, Axe Marks 25,000 years old, Tidal Waves (Causes). Then a few yellowish-brown pages containing oddities in the news, The Living Death (story), Will There Be Another Ice Age?, Doctor Hackensaw's Secrets (story), Month's Latest Devices; then other articles such as studies of the plant world, New Devices, Odds and Ends of Physics, Everyday Chemistry, Scientific Problems and Puzzles, the Constructor, a dozen pages on radio, a page for the novice, hints, oracle, latest new sets, etc. From July 1926, Norge's Flight Over North Pole, Raising the S-51, Bottle-Feeding the Orchid, Electricity from Sunlight, Ancient Torture Methods, Lost World Above Berlin, Starvation Limit Illustrated, A Dozen Daily Dangers, New Devices of the Month, Odds and Ends of Physics, Monthly Scientific News Illustrated, Tarrano the Conqueror (story), Experimental Electrics, Junior Electrician, more pages on radio—all the above mentioned of the three very interesting, not to mention small articles too numerous to mention.

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# VALVE

**Joseph H. Kraus**

## *Will Be Welcomed by the Editors*

The above also includes monthly departments such as wrinkles, oracles, forums, etc.

Now here are the articles in the three 1930 copies I mentioned, which I can say were interesting: In January 1930: Would You Believe It? (Facts stranger than fiction); Preparing Dyes and Pigments; February 1930: World's Highest Railway (Facts stranger than fiction). How to Make Nicotine, Methane, Phenol. May 1930: Arctic Fever and Tropic Frostbite, Feed Your Plants With Chemicals.

Now do you see the difference? That's my honest opinion. Now, others may be different; I do not want it all my own way. For instance, I am not interested in Motor Hints, as I have no car, but others, of course, have, and are interested. Now allow me to mention a number of articles and departments which I think you should have in every month: A Dozen Daily Dangers, New Devices of the Month, Odds and Ends of Physics, Monthly Scientific News Illustrated, A Continued Scientific Story, Experimental Electrics, Junior Electrician, How To Make It, Wrinkles, Recipes and Formulas, Readers' Forum, Radio Oracle and Monthly Pages on Radio Department, The Oracle, Scientific Humor, Latest Patents, Oddities in the News, Everyday Chemistry, Scientific Problems and Problems and Puzzles, Motor Hints, Kinks for the Shop and Laboratory, Improving the Home, and Would You Believe It?; together with scientific articles on model building, construction, and other topics far and near. It has been a pleasant half-hour for me to sit down and write to you about your magazine. I really think it would be better if you follow the path SCIENCE AND INVENTION took a few years ago. Again reminding you that I do not wish to criticize or offend, but wish only to help.

DONALD C. AMOS,
Winnipeg, Man., Canada.

*(However, Mr. Jurenek, the writer of the letter which follows, does not entirely agree.*—EDITOR.)

### Quarter-Century Subscription

IN April, 1914, I believe it was, I purchased at a newsstand my first copy of the Electrical Experimenter, and shortly thereafter sent in my subscription to have the magazine sent regularly to my home. I have been receiving it ever since—about 16 years.

Now, your "Last Chance" warning on page 1146 of the April, 1930, issue states that the subscription price will be boosted. However, I notice that you are giving your subscribers the option of extending their subscriptions one, two or three years. This is fine, but I'm wondering if we, the old timers, cannot extend our subscriptions for a longer period. There are, no doubt, others who will want to keep on receiving the SCIENCE AND INVENTION Magazine right up to the last minute when they will be patted on the face with a spade, and as I expect to live a good many years, I would like to send you my subscription for 10 years, with a check for $11.00.

Page 1146 states that the price is $1 more than the number of years, so I figured that $11.00 for 10 years would be O. K.

I would like to hear from you if it is consistent with your policy to accept the subscription I would like to send you, and if I have figured the price correctly.

E. A. JURENEK, Cleveland, Ohio.

*(Mr. Jurenek did not figure the subscription rate correctly. In view of the fact that this was the first request made to round out a quarter-century subscription, we gave Mr. Jurenek a special reduced price, to which he replied:*

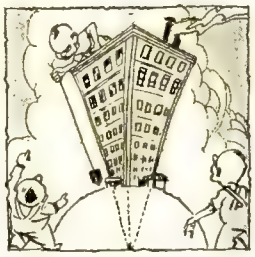
*"I greatly appreciate the concession you have made in favoring me with a special price, and would like to have you extend my thanks to the Subscription Department for their co-operation. Also tell them that I am honored in being listed as the first Quarter Century subscriber.*

*Conforming to your letter, I am pleased to send you herewith my check. As in the past, I shall look forward with a great deal of pleasure to receiving each succeeding month's copy of the most interesting publication.*

*You may be sure that I am genuinely happy to have this opportunity of continuing my subscription on the liberal basis made possible through your efforts, and again I thank you sincerely."*—EDITOR.)

### Resistance, Heat and the Plumb Line

THERE are two questions that I would like to be enlightened on through the medium of your Safety Valve. The first is, "Does resistance cause heat in an electrical circuit?" If so, why is it that the less ohms resistance in a heating coil, the more heat it will produce, or in any circuit as the resistance decreases, the amperes increase and the more amperes, the more heat?



The second question is in regard to the accuracy or inaccuracy of the plumb bob. Do the sun and moon affect a plumb bob and if so, from what height would a plumb bob have to be hung in order to make an inch of variation, say at the time of an eclipse when they are both pulling together; also if a plumb bob is used to plumb the walls of a high building, would it not cause the building to have more square feet of area on the top than at the base, as shown in illustration?

JOHN FRAWLEY,
Reprisa,
Cal.

*(Heat in an electrical conductor is in direct ratio to the watts in the circuit. Naturally, with an increase in resistance, the amperage is lowered, but assuming that the wattage remains the same, the heat for that conductor will be the same. The following formula will answer all of the questions which might arise in your mind.*

$$H = \frac{R C^2 T}{4.18}$$

*in which H is the heat in calories developed in a circuit by an electrical current of C amperes, flowing through a resistance of R ohms, for T seconds. With the current the same, and the time the same, the heat will change with the resistance. With wattage in the circuit the same, a variation in the resistance will change the amount of current in amperes, but the heating effect will be the same.*

*Your conclusion with reference to the plumb bob is correct. A large building would taper as you indicated in your diagram. In order to help you determine what the effect of the sun and the moon would be on a plumb bob on this earth, we call attention to the old formula. The force of attraction between two masses is directly proportional to the masses, and inversely is the square of the distance. The mass of the earth is generally considered as one; the sun 332,000, the moon .0123. The mean distance from the earth to the sun is 92,900,000 miles. The mean distance of the earth to the moon is 238,854 miles. With the weight of the earth estimated at 6,000,600,000,000,000,000,000 tons, we leave you to work out the calculation of the combined gravitational influence of the sun and moon on a one-pound plumb bob, let us say one foot above the surface of the earth.*—EDITOR.)

### Radio-Active Solar Pad

WHY have any physical ailments? This pad is just as good for warts, corns, bunions, ingrowing toenails, sunburn, falling hair or fallen arches. As for the results from its use in cases of the pip—Well, you'd be surprised! And please note the hair of the young lady wearing the pad. You should have seen it before she began using this treatment. (The picture must have been mislaid as I can't seem to put my hand on it at the moment.)

One more proof that Puck had the right idea.

R. L. HASTINGS,
Stratton, Maine.

*(With this letter the writer enclosed a clipping from a popular magazine advertising a radio-active solar pad. The readers of this publication know what the editors think of all of these radium cure-alls. Our contention for the past five years has been that radium given in doses large enough to do good can also do harm. If the item is absolutely safe, it follows that it is totally worthless.*—EDITOR.)

### Wants More Chemistry

I FIND your magazine interesting, especially articles pertaining to chemistry. As soon as your magazine arrives, I look up the experiments and rush to the laboratory to perform them, but there are too few.

Back in the days when you ran SCIENCE AND INVENTION with the EXPERIMENTER, more space was devoted to this subject. Nevertheless, if you continue I'll be satisfied.

JOSEF MILOTA,
Cleveland, Ohio.

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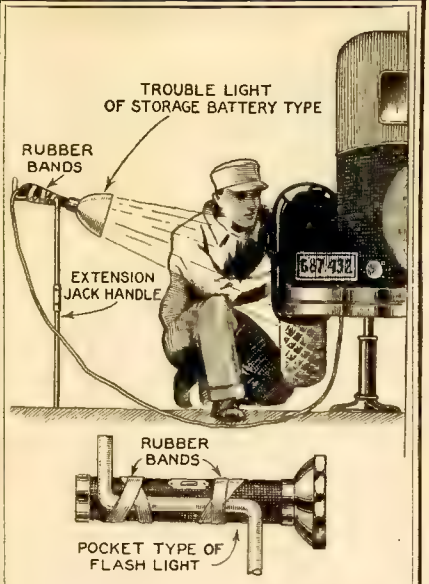
# Improve the Car *for Summer Touring*

By George A. Luers

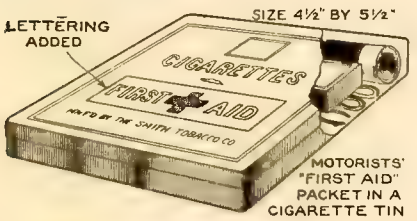


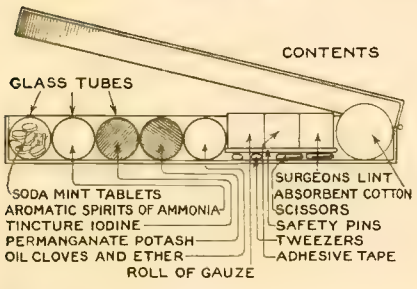

## Some Light on Tire Trouble

TIRE changing is a task in daylight, while at night the difficulty is increased for the reason that lugs, fasteners and tools are so hard to locate. Here is a time and trouble saver that the motorist should try on the next occasion for tire changing.

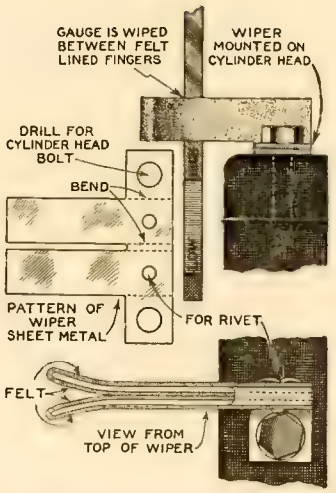
In the method illustrated, an upright is used as a support for the light. An extension jack handle, can be used. This is forced into the ground and the trouble light is secured to this, using one or more heavy rubber bands. An ordinary flash light can be mounted to equal advantage in this manner.

## First Aid for the Motorist




THE first aid kit shown in the attached sketch is a serviceable and compact accessory for the motorist. It is a simple flat metal container, such as is used for holding fifty cigarettes, and may quickly be made up from the medicine cabinet of any home. It can be stowed in the side pocket of the car and ready for any emergency, from the sting of an insect to a more severe injury such as a cut or bruise.



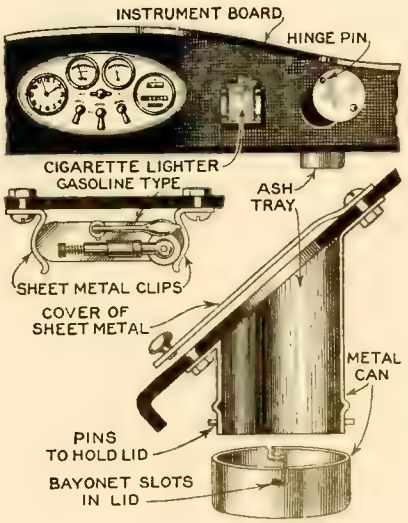

## Oil Gauge Wiper Prevents Grit

WHILE pouring oil in the engine, the test gauge is usually placed in the engine pan of the car. Grit clings to the point and unless wiped off it goes down into the engine with most certain detrimental effect.

A piece of sheet metal is bent to form a holder for a piece of felt of the type that can be obtained from a felt hat. One end of the holder is drilled and by means of a cylinder head bolt through this hole, the wiper is mounted directly above the filler spout on the side of the engine.

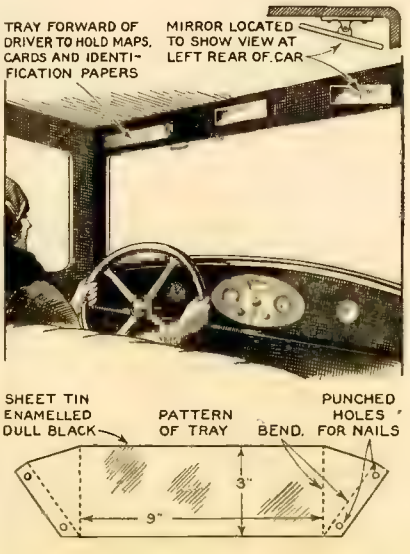
## Dash Lighter and Ash Tray in Engine

TWO small metal clips, bent to the shape shown and secured to the dash of the car, provide for a cigarette lighter of the type that burns gasoline.




Adjacent to this is a circular opening in the dash, covered by a hinged lid. Beneath this and fastened by small screws is an ash container made from a small metal container.

## Extra Mirror and Pocket Tray Help in Touring


TRAY FORWARD OF DRIVER TO HOLD MAPS, CARDS AND IDENTIFICATION PAPERS
MIRROR LOCATED TO SHOW VIEW AT LEFT REAR OF CAR
SHEET TIN ENAMELLED DULL BLACK
PATTERN OF TRAY
BEND.
PUNCHED HOLES FOR NAILS
3"
9"

THE enjoyment of a tour is made or marred by the equipment on the car. For example one tourist driving west found each evening that the blazing sun in the eyes of the driver caused headaches.

Finally smoked glasses were procured and less difficulties attended the driving of the car.

An example of tour planning for the driver's comfort is the arrangement of an extra mirror and tray. The mirror is placed so the driver can watch out for cars passing around to the left side. The tray forward of the driver is convenient for maps, driving glasses, cards and identification papers.

The mirror and bracket can be bought intact at any accessory shop, while the tray can be made from sheet tin and mounted on the car with small brads.

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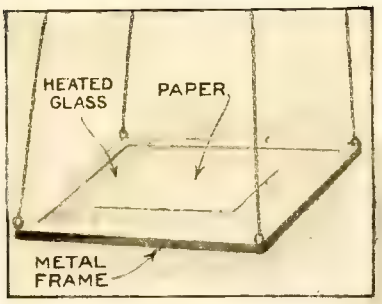
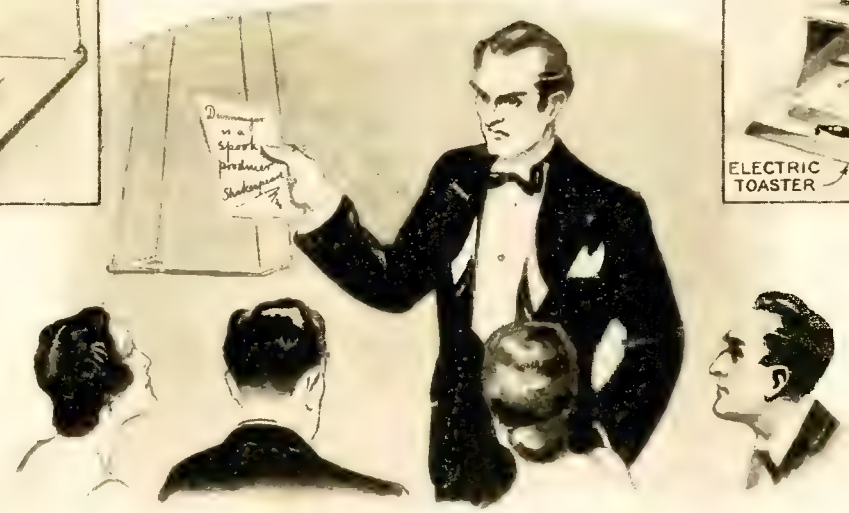
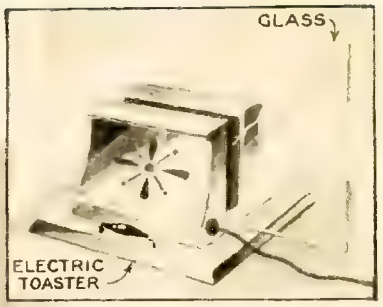
# MAGIC




SPOOK HANDS: *The wizard passes a pad of paper for inspection, a sheet of which is chosen by a spectator who initials it for identification. The paper is then placed face downward on a glass plate. When removed a message of many words is found.*






SECRET: *The paper has been previously prepared by writing messages upon it with a dilute solution of sulphuric acid. A clean gold pen should be used. The messages are developed by a heated glass. The audience is not told of the heating process.*

## A Memory Test

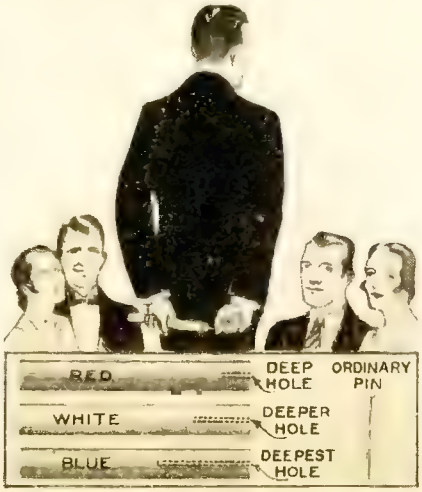
THIS is an excellent pocket trick, easily constructed by anyone and very simple to present. The magician shows two playing cards and remarks that there is not one person in his audience who can remember the suits of the two cards. One of the spectators will naturally contest the statement and he becomes the victim. The cards, let us say the trey of diamonds and the ace of spades are placed face downward on the table, and when lifted up again, the trey will have been converted into an ace. The secret lies in

the fact that one of the cards has a small flap attached to it as indicated in the illustration. When the two cards are displayed, the ace of spades covers a portion of the trick card. In the act of placing them on the table the card flap is turned over. At a short distance this flap is quite invisible, particularly if the back of the card is of the striped design variety.

By Hunninger *

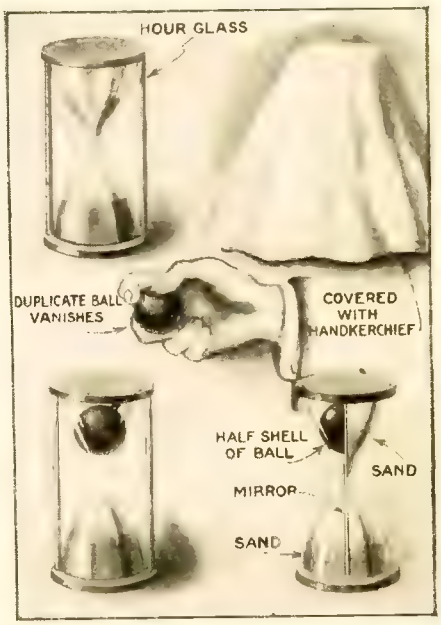
## The Patriotic Sticks

HERE is an experiment in what can be classed as thought reading. The magician shows three sticks painted red, white and blue. They are all the same length and the same diameter. Each has a small hole drilled in the end. He also exhibits a container, tube-like in form, with a cover. He requests any member of his audience to place one of the colored sticks in the container, and conceal the other two, and then to return the container to him. Holding this behind his back, he promptly mentions the color of the stick contained in the metal tube. The secret lies in the fact that the wooden sticks have been drilled so as to receive an ordinary pin. The depth to which this pin can be inserted indicates the color. Both ends of each stick should be drilled so that the pin will always give a reading. The diagram explains the details of operation.




## The Magical Hour Glass

THE magician exhibits a large hour glass of apparently common type. He sets this up and calls attention to the sand dropping from the top half to the bottom half. He then covers this hour glass with an ordinary handkerchief. Picking up a billiard ball, he promptly proceeds to make it vanish. Removing the handkerchief from the hour glass, he shows that the billiard ball has apparently found its way into the upper portion of the hour glass. The secret lies in the preparation of the apparatus. This is divided ver-




tically by a double-faced mirror, preferably of metal silvered on both sides. A half shell of a billiard ball is fastened to the mirror, as the diagram shows. under cover of the handkerchief, the magician has but to turn the hour glass to bring the ball into view. A solid ball is vanished in any of the approved forms explained in previous articles of this series.

*No. 82 of a series of magical articles appearing monthly.

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# Let's Laugh

*ALL jokes published here are paid for at a rate of $1.00 each; $3.00 is paid for the best joke submitted each month. Jokes should be scientific. Write each joke on a separate sheet of paper and add name and address to each sheet of paper.*

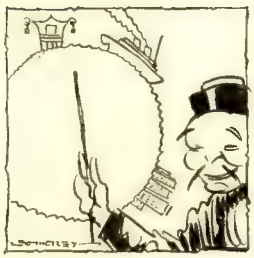
### GOOD IDEA

MARION—What would you give for a voice like mine?

HELEN—Chloroform.

—*Miss Pauline Marotte.*

### SIMPLE ENOUGH WHEN YOU UNDERSTAND



In discussing geographical science with a group of oriental friends, the conversation turned to the vexing problem of the international date line—the gaining of a day while coming here from China, and the losing of it on the way back.

Ah Foo explained quite easily: "The world he round, all same orangee; China uphill, America downhill. You go China, up hill allee way, boat go more slow, lose one day. You come back again, down hill allee way, boat go more quick, catchem up one day.

—*W. J. Wilby.*

### SCIENTIFIC HUMOR

NERVE CASE—Doctor, I often feel like killing myself. What shall I do?

DOCTOR—Leave it to me.

—*Walter A. O'Keefe.*

### LAUGHING SHIRTS

SALESMAN — These shirts simply laugh at the laundry, sir.

CUSTOMER—I know. I've had some come back with their sides split.

—*Herbert Auer.*

**First Prize $3.00**

### JUST A LITTLE MIXED

The duties of a justice of the peace included only an occasional marriage ceremony, and at times he often found it difficult to dissociate the various functions of his office. He was marrying a couple one day and had reached the question, "Do you take this man to be your lawfully wedded husband?" The bride nodded emphatically. "And you, the accused," continued the justice, turning to the bridegroom, "what have you to say in your defense?" —*Mrs. H. E. Chrisman.*

### CORRECT!

HE—How do you like my electric suit?

SHE—What's an electric suit?

HE—It's one you order by wire and have charged.

—*Mrs. R. L. Livingston.*

### HE DID RIGHT

NUTS—I heard your car was stolen.

FAGAN—Yeah, I got there just as they were driving off.

NUTS—Did you see who they were.

FAGAN—No, but I took the license number. —*R. Kestermont.*

### AMONG THE LEARNED

PROFESSOR—I do wish those neighbors' children would stay out of that soft concrete.

HIS WIFE—I thought you liked all children.

PROFESSOR—In the abstract, yes, but not in the concrete.

—*Mrs. H. E. Chrisman.*

### JUST GETTING STARTED

OLD GOLF CLUB MEMBER — Well, what did you do it in?

NEW MEMBER—Seventy-six.

OLD GOLF CLUB MEMBER—Very good indeed.

NEW MEMBER—Yes, and tomorrow I'm going to play the second hole.

—*Leota Gray.*

### AN ACCREDITED MEMBER

BUSINESS MAN—I suppose you are on the football team?

JOHNNIE—Well, yes I do the aerial work.

BUSINESS MAN — What's that?

JOHNNIE—I blow up the footballs.

—*Lowell Mayer.*

### THE TRUTH

PROFESSOR—Before long we may expect an invention that will enable us to do without sleep altogether.

STUDENT—What's the matter with the saxophone?

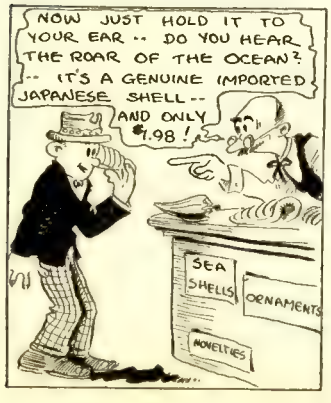
—*George Beisser.*

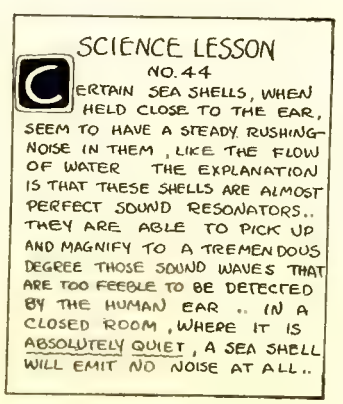
### PROOF POSITIVE

"If, as you admit, you were three miles away digging potatoes when this man was arrested for speeding, how can you testify that the car was doing at the most only twenty miles an hour?"

"Jedge, Ah used to own that cah."

—*M. R. Bercovitch.*


NOW JUST HOLD IT TO YOUR EAR -- DO YOU HEAR THE ROAR OF THE OCEAN? -- IT'S A GENUINE IMPORTED JAPANESE SHELL -- AND ONLY $1.98 !
SEA SHELLS
ORNAMENTS
NOVELTIES


SCIENCE LESSON
NO. 44
CERTAIN SEA SHELLS, WHEN HELD CLOSE TO THE EAR, SEEM TO HAVE A STEADY RUSHING-NOISE IN THEM, LIKE THE FLOW OF WATER THE EXPLANATION IS THAT THESE SHELLS ARE ALMOST PERFECT SOUND RESONATORS.. THEY ARE ABLE TO PICK UP AND MAGNIFY TO A TREMENDOUS DEGREE THOSE SOUND WAVES THAT ARE TOO FEEBLE TO BE DETECTED BY THE HUMAN EAR .. IN A CLOSED ROOM, WHERE IT IS ABSOLUTELY QUIET, A SEA SHELL WILL EMIT NO NOISE AT ALL..

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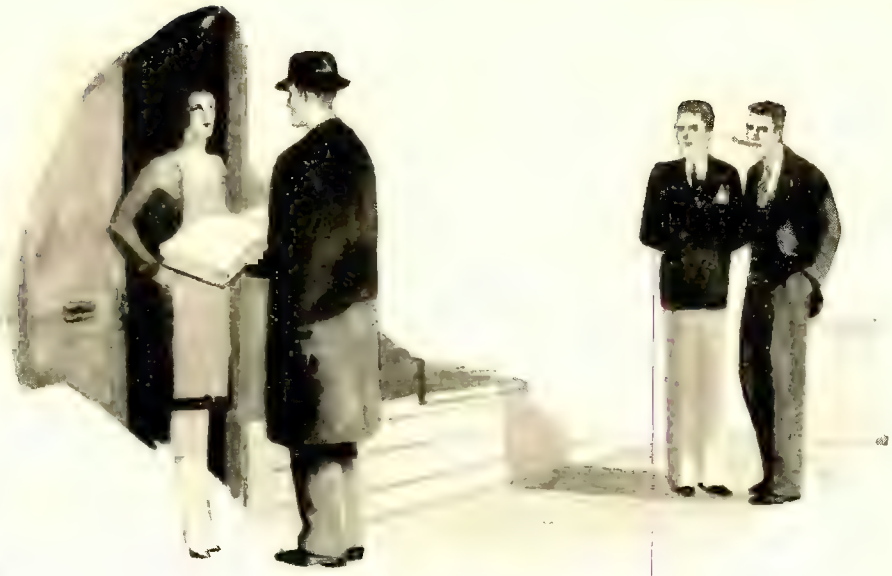
# Prize Puzzles *to* Polish Your Wits

By Sam Loyd



***THE Puzzle King presents the seventh of a series of problems, the solving of which will show if your mathematical ability is bolstered up by logical reasoning. Prize winners of the April puzzles and contest conditions will be found on page 259.***

## The Census Man's Puzzle

AT Madame McCarthy's pension are two mysterious guests, known familiarly as Moe and Mike.

When the Census Man had finished his interrogation of the boarders, Madame corralled him in the hope of gleaning some data on Moe and Mike, incidentally asking what their ages might be.

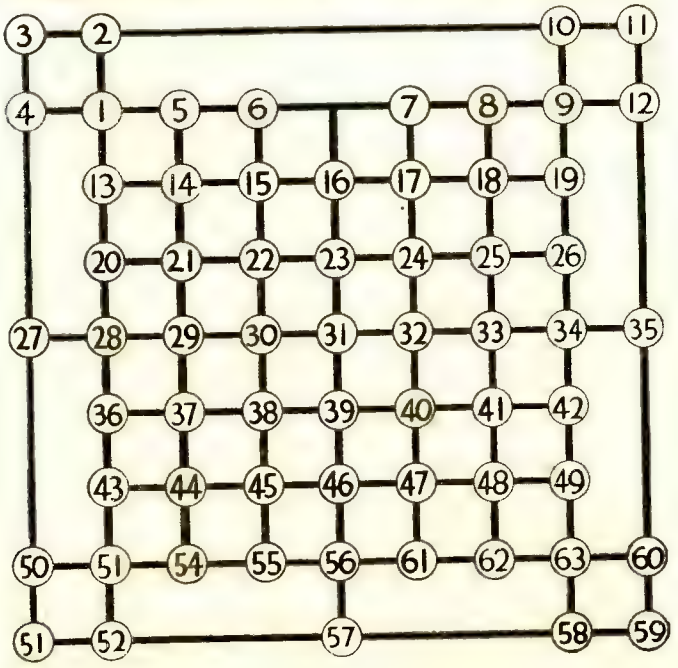
"Of course, census information is confidential," replied the enumerator, "but, regarding the ages of these boys, I don't mind giving you a little inside tip. Now, follow me closely."

"THE COMBINED AGES OF MOE AND MIKE ARE 60 YEARS, AND MOE IS TWICE AS OLD AS MIKE WAS WHEN MOE WAS HALF AS OLD AS MIKE WILL BE WHEN MIKE IS THREE TIMES AS OLD AS MOE WAS WHEN MOE WAS THREE TIMES AS OLD AS MIKE."

The Census Man's information is a bit involved, but if carefully deduced will furnish Madame with the required information. Let us see who can discover the ages of Moe and Mike.

## A Puzzle From Old Egypt

"THIS is a blueprint of the famous Tut-ankh-Amen discoveries," explained my friend the archeologist. "You see, it presents a symmetrical arrangement of sixty-three chambers; the black lines representing passageways.




"We first sank a shaft to chamber numbered 1, and from that point proceeded step by step through all of the other rooms until our final discovery of the young Pharaoh's tomb, numbered 63 on the chart."

A study of Pharaoh's tomb and its ante-chambers reveals that it possesses many puzzling features. Perhaps Ahmes, the Egyptian priest, whose writings reposing in the British Museum establish him as the world's original puzzle-maker, had a hand in the designing of this ancient subcellar.

Let us consider the following question in connection with the map:

How could the explorers have started at chamber 1 and proceeded to 63 by a march that passed through all of the chambers (once each) and made the least possible number of right-angle turns *en route?*

Give a sequence of the numbered chambers in the order they are visited, and at top of your solution sheet set down the total number of turning points in your route. For example: 2, 3, 4, 27, 50, 51, 52, 57, 58, 59 would cover ten of the chambers with only three turning points.

### *Twenty-five Dollars in Prizes*

A FIRST PRIZE of $10 will be awarded to the person sending correct answers to the two puzzles *accompanied by the best expressed analysis of the Census Problem.*

A SECOND PRIZE of $5 will be awarded for the next best analysis and correct answers to the two puzzles.

TEN PRIZES of $1 each will be awarded to the ten persons who send the next best analysis of the Census Problem, together with correct answers to the two puzzles.

Answers must be received not later than noon, July 15, addressed to "Puzzle Editor," SCIENCE AND INVENTION, 381 Fourth Avenue, New York City.

All contestants must abide by the decisions of Sam Loyd, who will examine all papers and award the prizes.

Papers of identical merit, tying for any one of the prizes, will each receive the full amount of the prize tied for.

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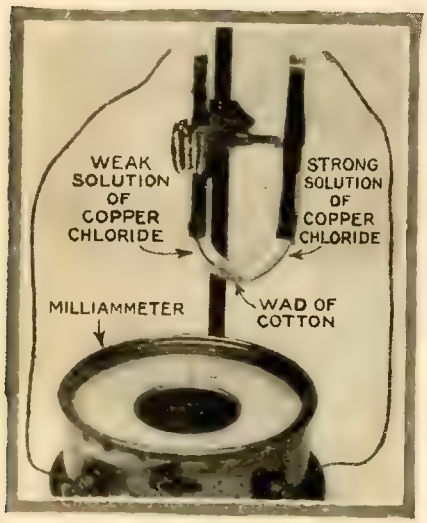
# Do These Electro-Chemical Experiments

ONE may use a single metal with a common solution, but of two different strengths in the following experiment in electro-chemistry. Thrust a wad of cotton into the bottom of a "U" tube. Place a copper wire or foil electrode in each limb and connect the electrodes to a galvanometer. In one




*With one metal and a common solution, a current of electricity may be produced which will register on a sensitive galvanometer.*

limb place a weak solution of copper chloride. In the remaining limb place a strong solution of copper chloride. A current of electricity is produced. The cotton keeps the two solutions from mixing quickly.

A USEFUL pole finding or pole testing paper is made by soaking white paper in about 100 cc of denatured alcohol to which has been added a pinch of phenolphthalein and about ten grams of salt. Dry the paper and keep in well-stoppered bottle. In use, the paper is wet with water and the two wires to be tested for polarity are touched to the paper. The paper about the negative wire will become colored intensely red.

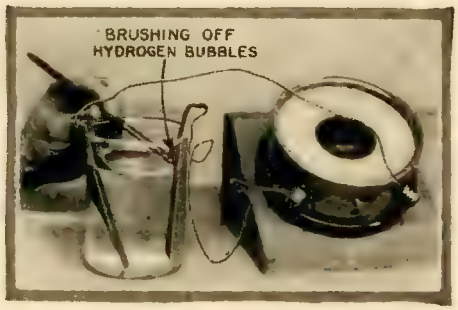
*The polarity of two wires may be tested with paper in this experiment.*

This paper will keep better than blueprint paper, which can also be used. If the wires carry alternating current, then both wires will cause the red color to form.

*Electrolysis between identical electrodes of copper produced by difference in temperature.*

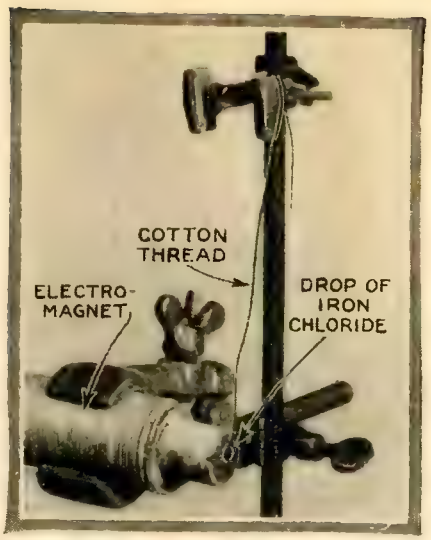
IF two ends of a copper wire are submerged in molten copper chloride, and one of them kept hotter than the other, the hotter end of the wire will dissolve, while the copper which it loses will be deposited upon the colder end of the wire. Do not use water in this experiment. Copper chloride will become liquid with heating.

POLARIZATION, or stoppage of current by a film of gas bubbles, is easily demonstrated by making a simple wet cell of a strip of copper and a strip of zinc in weak sulphuric acid. When the cell is connected to a gal-



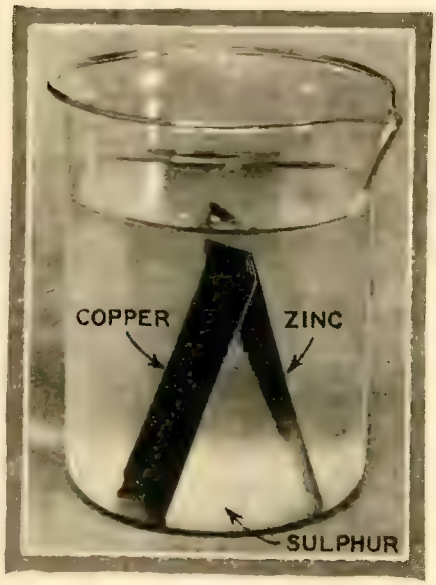

*A galvanometer or the polarity test of the second experiment will illustrate polarization in a simple wet cell.*

vanometer or sensitive voltmeter, a current will flow, which will soon cease, due to polarization. If the hydrogen gas bubbles which cause polarization are brushed from the copper strip, the current will again flow.




*A Ford spark coil and cotton thread will demonstrate electro-magnetic attraction.*

A SMALL electromagnet such as that taken from a Ford spark coil, or better, an old "gas lighting" coil, can be used to show the magnetic effect of a liquid, in this instance, a solution of iron (ferric) chloride. Make a small loop in the end of a cotton thread about a foot long. Immerse the loop in the solution and a drop of the liquid will be drawn into the loop by capillarity. Suspend this drop of liquid near the pole of the magnet and it will be attracted. The greater the current (amperes) flowing, the greater will be the attraction.




*White powdered sulphur may be produced by the electrolytic dissociation of sulphurous acid.*

COPPER or zinc alone is not attacked by sulphurous acid. If a "couple" is made by attaching a strip of copper to a strip of zinc, and this pair immersed in sulphurous acid, decomposition of the acid will ensue, with the production of sulphur, which will form in the vessel as a fine white powder. Sulphurous acid can be made by passing sulphur dioxide gas into water.

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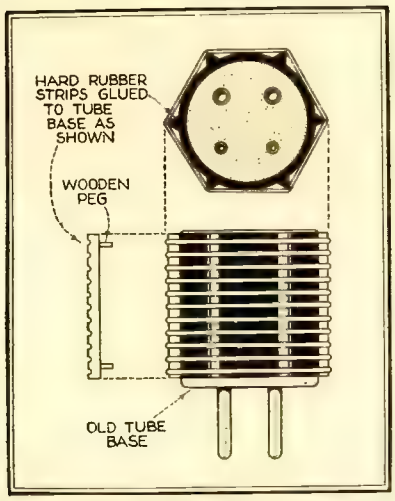
# Flashes from the Radio Lab

## *We Continue the Department Started in the June Issue. Here Are Some More Novel Ideas for the Radio Fan*




*Anyone who winds coils, especially for short-wave use, will find this idea of much value.*

### Low Loss Coil Base

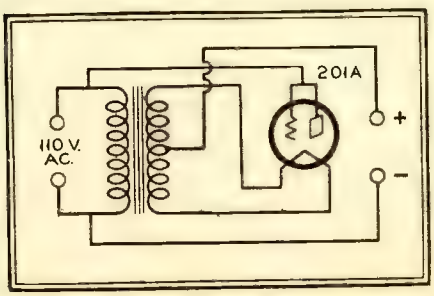
MANY fans now constructing short-wave sets will find a good method of making a low loss, tube base coil by reverting to the old idea of placing hard-rubber strips under the windings. Each strip can be made either with a triangular or flat surface. They are glued on the tube base and can be made more stable by drilling small holes in the strips, and inserting small wooden pegs, corresponding holes to fit the pegs being drilled in the base. The strips can also be extended until they overlap on a second tube base. This will give a coil frame of almost any length and would permit spaced winding and the use of bare copper wire.—*L. B. Wyatt.*

### "B" Battery Charger

FOR my own part, I have never reconciled myself to the electrically operated sets. I purchased a storage "B" battery of the lead plate type, which I obtained for two dollars. I cleaned it up and charged it with this charger for the cost of a tube and socket. This gives me over ninety volts of good steady power, and if the lights go out I still have music.

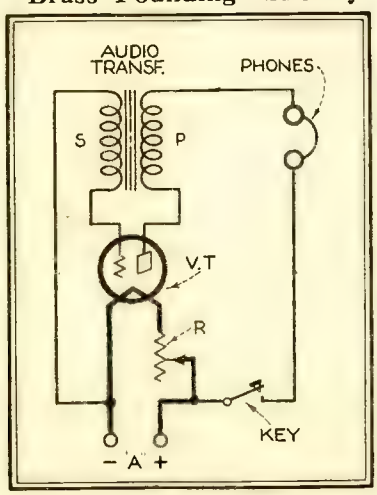
First get an old Ford coil, remove the secondary and primary. Carefully dig out the wax between the two secondary blocks and find the connection; be very careful, as it is fine wire. Break this connection and wrap a piece of stranded wire around each of the blocks and secure it with tape. Leave an end free for connecting, then solder the fine wire to this and connect the secondaries in parallel. Now push out the primary and wind on two more layers of wire about the same size as that on it, wound in the same direction. Use the joint for the center tap. Remove some of the heavy paper from inside the secondary until the new primary will go inside. Connect this to 110 volt line. It should show about four volts across the primary.

Get a one-inch board four and a half inches square. Bore a hole to hold the coil, and adjacent to it mount a UX socket. Two Fahnestock clips should be placed next to the socket. The line cord is connected to the coil. The positive pole goes to the *plus* side of the battery and so forth. Place a 201 tube in the socket and it is ready for use.—*Cecil Hebb.*



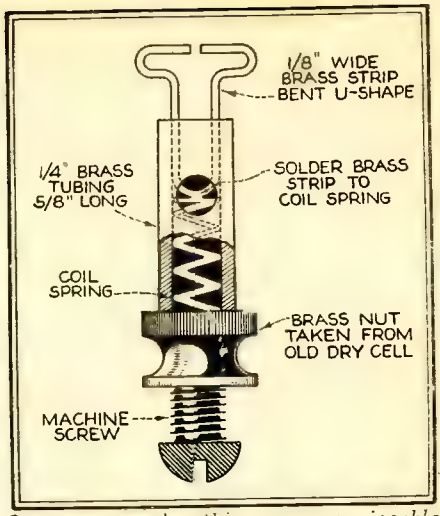

*Many folks who still use battery operated sets will want to make this "B" battery charger.*

### "Brass Pounding" Silently




*If the rest of the family objects to the embryonic radio operator "pounding brass," we would suggest the construction of this instrument.*

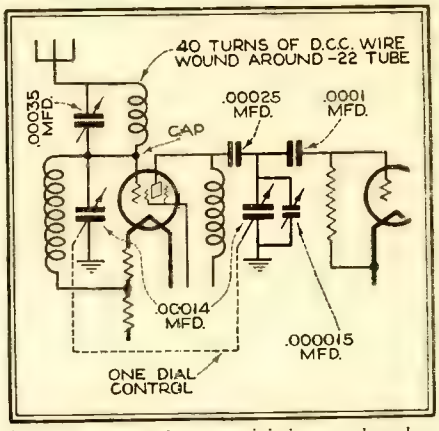
IF you wish to practise code but find that a buzzer arrangement is objectionable because it disturbs the rest of the family, try this method. If it does not oscillate when first connected, reverse primary connections on the audio transformer. The volume and tone may be controlled by the rheostat.—*Luther Loughry.*


1/8" WIDE BRASS STRIP BENT U-SHAPE
1/4" BRASS TUBING 5/8" LONG
SOLDER BRASS STRIP TO COIL SPRING
COIL SPRING
BRASS NUT TAKEN FROM OLD DRY CELL
MACHINE SCREW

*One may make this very serviceable binding post from odds and ends found in any home workshop.*

### Push Binding Post

THIS binding post may be made very easily by soldering a piece of ¼ inch brass tubing ⅝ inch long to a dry cell nut. Drill a hole ¼ inch from the top of the tubing large enough for a phone tip. Bend a strip of brass into "U" shape, and solder to a coil spring, which fits into the tubing.—*Alvin Porter.*




*To increase the sensitivity and selectivity of a short-wave set, we recommend this arrangement.*

### Improving the Short-Wave Set

SOME short-wave sets are not as sensitive as they might be, and in addition tuning is not easily accomplished. Here is an idea I used on my set, and found my reception very much improved, as to sensitivity, selectivity, and ease of tuning. It is merely winding forty turns of double cotton covered wire around the screen-grid tube. This is connected to the grid circuit as shown in the illustration.—*Burt Robbins.*

**This is the page of the radio fan. If you have any novel ideas or practical hints which you have found of value in your radio work, send them to the Radio Editor. Regular space rates will be paid for all material accepted and published.**

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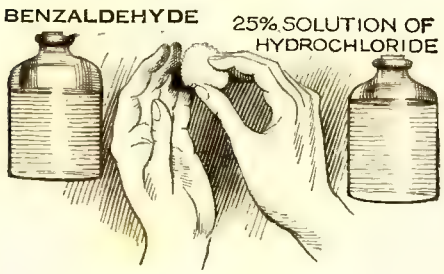
# The Oracle

## Remove That Stain

Mr. Albert Drapeau, Lewiston, Maine, writes:

Q. 1. How can the stain produced by mercurochrome antiseptic be removed?

A. 1. According to the experts of the U. S. Bureau of Standards, this stain can be removed by the application of benzaldehyde followed by 25 per cent




*The stains of mercurochrome may be removed from fingers with the above solution.*

hydrochloric acid solution and by sponging with alcohol and then water. The stain must be fresh in order to be entirely removed.

## Electricity Can't Be Slowed Down

George A. Biston of Delta, Colorado, writes:

Q. 1. How are large amounts of infra red rays obtained?

A. 1. Infra red rays are invisible and are usually termed heat rays. Any object heated sufficiently to radiate heat and not be luminous is radiating the rays you speak of, thus a coal stove which is not heated to redness, radiates only infra red rays.

Q. 2. Can the speed of electricity be reduced?

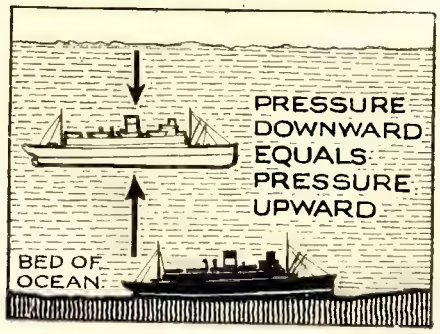
A. 2. The speed of electricity cannot be affected, any more than can the speed of light. But in the application of electricity there is often an effect produced which resembles the decrease of speed. If the connection is made to a conductor possessing considerable capacity, it has to be charged with electricity before its distant end will have acquired the full current intensity existing at its sending end. Therefore, there is a considerable delay in the case of such conductors between the opening of the circuit at the sending end and the reception at the distant end, of a strong current. This is particularly noticeable in underwater cables, which with their conducting cores and insulated coating, immersed in water, and generally armored, constitute veritable leyden jars. Before the current at the distant end can deliver more than a fraction of the original amount, the cable has to be charged with a requisite quantity of electricity. But this is no true reduction of speed of electricity; such speed is the same as that of light, approximately 186,000 miles per second.

## Down to Davy Jones

Mr. Charles H. Warner, San Francisco, California, writes:

Q. 1. If a ship sinks below the surface of the water, will it continue on its way down until it reaches the bottom, or will it remain in some intermediate position, buoyed up by the denser portion of the water?

A. 1. When a ship sinks below the surface of the water, it will continue to sink until it reaches the bottom of the ocean where it may or may not come to rest, dependent entirely upon the currents and the nature of the ocean. Sometimes after a storm a vessel at a depth of 150 feet will be carried clear out to




*When a ship sinks, it goes to the bottom. The density of the water will not buoy it up.*

sea and lost for months, divers have frequently discovered. There is no such condition as a ship sinking and coming to rest in the denser portions of the water, which are naturally down at the bottom of the ocean, because water is so slightly compressible that there is no practical effect in the buoying up of a sunken vessel and while it is true that pressure is exerted on a vessel in an upward direction, it is also true that a similar and identical pressure is being exerted in a downward direction. It has been discovered that a submarine cannot maintain a state of equilibrium; that is, it cannot sink to a depth of 20 or 30 feet or more and stay there without the necessity of hovering in that particular position. This is accomplished either by means of elevating and depressing rudders when the submarine is in operation, or by means of compressed air which lets in a small quantity of water into the ballast tanks or expels this quantity of water, replacing it with air when necessary.

***The Oracle is devoted to questions of general interest to our readers. Direct mail answers will be given at the rate of fifty cents per question.***

## For the Amateur Sculptor

George C. Lutes of Toronto, Ontario, writes:

Q. 1. What is the formula for a plastic modeling clay similar to plasticine?

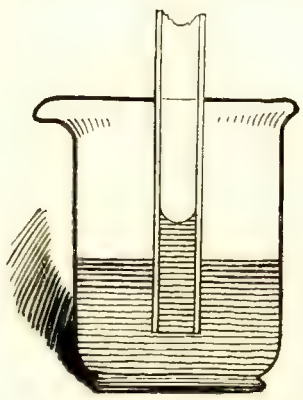
A. 1. A permanently plastic clay can be obtained by first mixing potter's clay with glycerine, turpentine, or similar bodies, and then adding vaseline or petroleum residue rich in vaseline. The proportion of clay to the vaseline varies according to the desired consistency of the product, the admixture of vaseline varying from 10 to 50 per cent. It is obvious that the hardness of the material decreases with the amount of the vaseline. By the use of various varieties of clay and the suitable choice of admixture, plasticity as well as the color of the mass may be varied.

## Capillarity and How It Occurs

E. Ludwig, Chicago, Illinois, writes:

Q. 1. When a glass tube is inserted into a beaker of water, the water rises in the tube. Can you give me the cause of this phenomena?

A. 1. This is a simple illustration of the capillary action. The adhesion between the water and the glass is greater than the cohesion of the water. This means that the attraction between the water and the glass molecule is greater than between the molecules of water. This results in a pulling of the water on the surface of the glass. The glass molecules cannot be pulled towards the water, so that the more easily moving water molecules are drawn upwards by the glass. Inside the glass tube the



*For the sake of clarity the capillary action in the beaker is not shown.*

water rises to form a concave surface. The surface tension or film then tends to straighten the surface of the water. This causes the water level at the center of the tube to be raised above the level of the outside of the tube, then at the inner surface of the tube the water is again pulled up to a concave surface at the glass, and the surface tension again straightens it. This alternate climbing at the edges and the subsequent straightening of the liquid surface in the tube continues until the weight of the column of the water liquid equals the surface tension.

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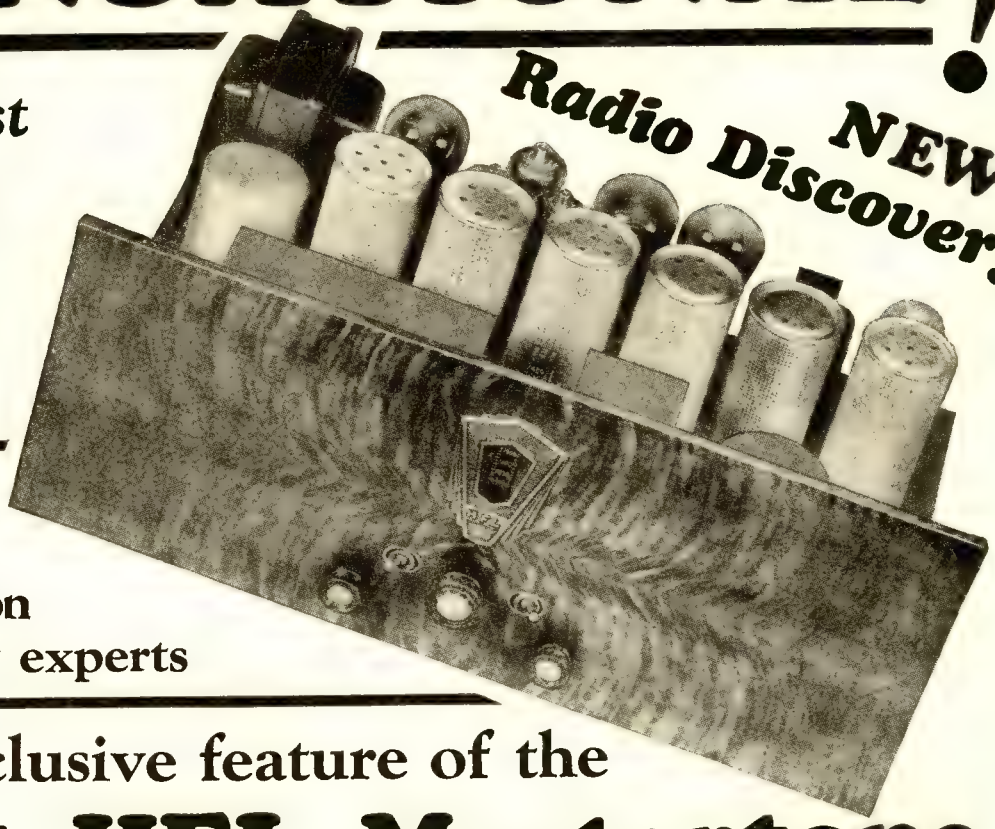
# SENSATIONAL!

- *Scientist*
- *perfects*
- *long*
- *sought*
- *device*

**NEW Radio Discovery**



- **Hopkins'**
- **amazing**
- **new invention**
- **approved by experts**

## Now an exclusive feature of the

# •1931 HFL Mastertone

At last! Radio perfection is realized. After three years of intensive research work, assisted by a corps of laboratory experts, Mr. Charles L. Hopkins, noted radio scientist, has actually developed the first practical band rejecting amplifier. This miraculous new system, long the dream of radio designers, permits the construction of a remarkably efficient receiver which is ideally perfect in operation. Stations over the entire continent may now be received with an ease of tuning, unprecedented clarity of tone and total lack of interference that astonishes engineers and fans alike.

### • Interfering Stations Rejected

Application of the Hopkins principle to the 1931 HFL Mastertone has immediately resulted in three outstanding improvements. Now, for the first time in radio history, it is possible to tune in an exact 10 kilocycle channel to the complete exclusion of everything else on the air. Not 9 or 11 or 16 kilocycles, but 10—with mathematical accuracy. Stations on each side of the selected band are sharply cut off and *actually rejected*. This heretofore unattainable action now takes place over the entire tuning range. The set does not "go broad" even on the highest wave lengths.

### • Tonal Perfection Realized

The salient feature of the Hopkins band rejector system is that it handles all musical frequencies with an absolutely even intensity. No sacrifice in selectivity is made in order to obtain these marvelously realistic tonal reproductions. Although the 1931 HFL Mastertone maintains a precise 10 kilocycle signal channel at all times, every note and each delicate overtone *right up to 5000 cycles* comes through with a life-like quality that is a revelation. Far distant stations have the same superb tones due to the complete elimination of all local interference.

### • 12,500 Mile Reception

Engineers the country over proclaim the 1931 HFL Mastertone to be the greatest long distance receiver ever designed. Its range is easily 12,500 miles (world-wide reception) whenever weather conditions permit such distances to be covered. Five 224 screen grid, two 227, two 245 and one 280 tubes are employed. A tremendous reserve power of *over 400 per cent* is available. The Mastertone is unconditionally guaranteed to receive any station on earth that can be heard with a radio set.

### • Ultra Modern

In addition to the Hopkins RF amplifying system the 1931 HFL Mastertone incorporates every modern improvement known to science. One dial, one spot, 180 K.C. intermediate amplifier. Resistance coupled, push-pull phonograph amplifier, controlled from panel. Puncture proof, high voltage, humless Electrofarad filter condensers. Self contained, all steel heavily cadmium plated chassis. Doubly shielded radio frequency circuits and dozens of other entirely new features. Our FREE literature gives complete information and prices. *Send for it today!*

**DEALERS: The New Mastertone is the sensation of the century. Get in on the biggest radio boom ever known. Rush this coupon attached to your business letterhead for special proposition. *ACT QUICKLY!***

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# PATENT ADVICE

**CONDUCTED BY JOSEPH H. KRAUS**

In this Department we publish such matter as is of interest to inventors and particularly to those who are in doubt as to certain patent phases. Regular inquiries addressed to "Patent Advice" cannot be answered by mail free of charge. Such inquiries are published here for the benefit of all readers. If the idea is thought to be of importance, we make it a rule not to divulge all details, in order to protect the inventor as far as it is possible to do so.

Should advice be desired by mail, a nominal charge of $1.00 is made for each question. Sketches and descriptions must be clear and explicit. Only one side of sheet should be written on.

NOTE:—Before mailing your letter to this department, see to it that your name and address are upon the letter and envelope as well. Many letters are returned to us because either the name of the inquirer or his address is incorrectly given.

### *Flashlight Combination*

(1222) Edward La Mothe, Detroit, Mich., suggests a new flashlight and writing pad combination on which he wants advice.

A. 1. The idea that you have advanced for a means of adding another light to a flashlight and a suitable bracket to hold a pad for writing, possesses some commendable features.

Unfortunately, we do not believe that a broad and basic patent could be obtained upon the same. The writer could devise a method for doing everything that your device does, which will not be as bulky, which will be more convenient to handle and will possess all the merits which your device has. As a matter of fact, one could dispense with the extra bulb, the extra arrangement on the side of the flashlight, and combine both flashlight and pad in one holder, leaving merely a hole in the back of the reflector so that some of the rays of light can be dispersed upon the pad and if necessary, the front of the lens can be silvered so that the light will be thrown back in part upon the pad itself. The pad itself would then be mounted directly upon the flashlight. Only one bulb need be employed, consequently the battery lasts a good deal longer. The flashlight acts as a holder for the pad and, therefore, as a better support thereof.

However, the entire system, while it lends itself to many and various applications, is by no means as good as the photographic method, that is now being used by some of the large electric light and gas companies. This system consists of a small camera with a suitable light that is flashed upon the meter and a photograph is instantly taken of the meter readings. Photographs being taken on paper are cheap, the readings are accurate and comparative figures can at any time be made.

You might be able to do something with this idea and then again you might not. We would suggest that the system be changed so as to incorporate the new features that we have outlined, and that you try to put the product on the market if you have already applied for a patent on the same.

### *Geographical Educator*

(1223) Parker W. Snapp, Eugene, Ore., asks for information on a geographical educator and a novel rotating toy.

A. 1. We do not believe that the game that you have devised presents any material advantages over the Knapp Electrical Questioner that is available on the market today. While this questioner is not made up in the form of a map, one can get cards that ask geographical questions.

In a New York toy shop there is a large map made substantially as you have indicated, except that instead of holes and plugs a tip is touched to a small metal electrode alongside of the name of a town, and then it is up to the individual to find the exact location of that particular town. The map itself presents hundreds of other electrodes which complete the circuit to a buzzer. The buzzer sounds loudly when the exact location has been discovered.

We believe that this device is substantially the same as the system that you think you have originated.

Pertaining to the toy perpetual motion novelty, we would advise that the motion of this contrivance is entirely too slow to make it worth while. This motion is even slowed down further than would naturally be the case because of the fact that you enclosed a metal shield around the entire contrivance, preventing, to a very great extent, the natural evaporation upon which this object bases its movement. This article is not a perpetual motion system, but is operated as mentioned before, by natural evaporation.

If the contrivance could be speeded up so that one need merely count the revolutions made in order to determine the amount of humidity in the atmosphere and a comparative chart were made to go with the same, you might be able to obtain some results in selling the project. We do not believe it patentable.

### *Caveats*

(1224) Richard Allen, Hartford, Conn., wants to know if the government issues any form of protection upon an idea, not yet developed for patenting, but upon which he is now working.

A. 1. The United States government no longer issues Caveats. This, at one time, was a governmental protection that permitted a man to work upon his invention and yet at the same time, establish a definite priority claim.

### *Carbon Elimination*

(1225) Albert Sollosy, Plunkett, Sask., Canada, asks for information relative to a method of preventing accumulation of carbon around auto valves. He also wants information on a gas saver.

A. 1. We believe that both of the methods for preventing carbon forming on the valve, as designed by you, are interesting enough to warrant further work upon them. We do not believe that any of the systems that you have outlined would be 100% perfect.

In view of the fact that carbon will be formed on the interior of the engine and in view of the fact that this carbon will be blown out by the scavenger stroke, and in further view of the fact that some of it must settle around the valve stem and also around the valve seat, it will be quite impossible to entirely do away with the carbon deposit here.

We would, however, suggest that you try this stunt out in an experimental sort of way.

Remember, however, that there is no carbon deposit formed on the valve portions of the single or double sleeve valve motor.

We do not think that your idea for a gas saver is of any value whatever, primarily because of the fact that substantially the same gas saver is being used on automobiles today and the idea, while not thoroughly or basically patentable, is already on the market.

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# PATENTS

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## Clarence A. O'Brien

*Registered Patent Attorney*

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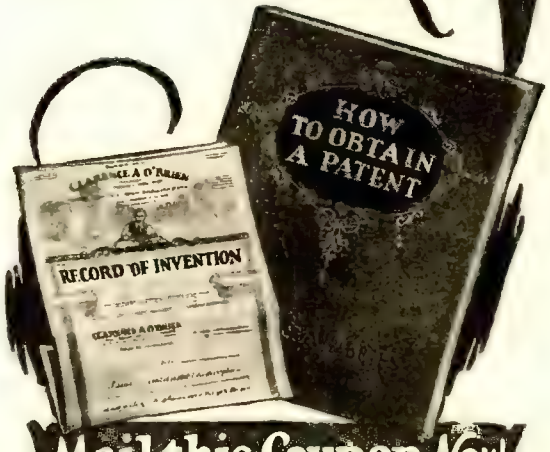


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# Yankee Brains *at* Work

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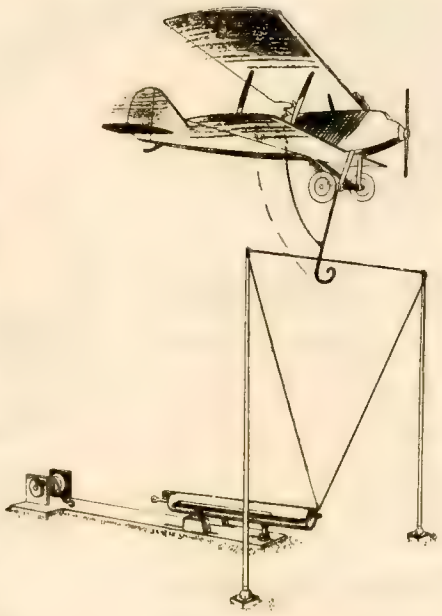
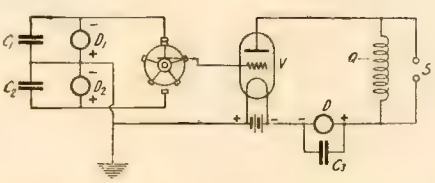


## Speeding the Air-Mail

*No. 1,744,934, issued to Blaine M. Tuxhorn. The invention relates to means for loading airplanes while in flight, the object being to enable an airplane to pick up a load without hazard or damage to the plane. The device consists of a movable supporting element, a releasable member carried by the supporting element and attached to a container. It also includes elastic cords for projecting the container.*

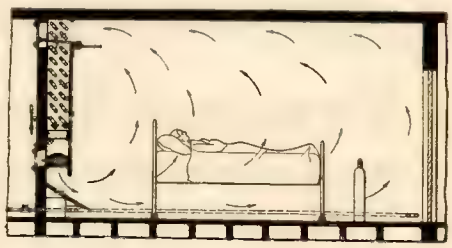
## Making the Sparks Jump



*No. 1,743,152, issued to Normal William McLachlan. The object of this invention is to provide improved means for obtaining electrical impulses of high voltage. It consists of a three-element tube, having an output circuit consisting of a large inductance coil, a source of direct current in series, etc. The input circuit consists of a rotating pole changer connected across two current sources and the grid of the tube.*

## For a Breath of Pure Air

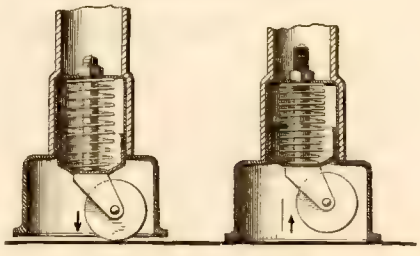
*No. 1,744,890, issued to Joseph F. Hanrahan. This invention provides an oxygen chamber in which a patient may have normal movement and can live*



*under natural conditions while undergoing oxygen treatment. It consists of an oxygen supply room containing a condensing chamber, a refrigerant in this chamber, and a thermometer for indicating the temperature. The oxygen chamber is open at both top and bottom so as to allow a free circulation of air throughout the room.*

## Cast Your Eye on This Caster

*No. 1,749,751, issued to John Bergsten. The important object of this invention is to provide a caster which will permit an article of furniture to be readily moved, and which is automatically rendered inoperative upon increasing the weight on the article of furniture, such as when a person be-*



*comes seated in a chair. It consists of a cylindrical portion arranged in a socket formed in the lower end of the leg of a piece of furniture, and a slidable cup in the lower end of the cylinder. A caster is carried by the cup, and on increase of weight the cylinder slides over the caster, rendering it inoperative.*

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# Answers and Prize Awards in April Puzzle Contest

By Sam Loyd

## Solution to "Mixing Paint"

THE paint merchant said that the bag of paint weighed 10 lbs., and the balance bar 5 lbs. Four-fifths of the bar, and therefore 4 lbs. of its weight, was on one side of the balance point.

Let us assume that the bar was 5 feet in length. Then at a point 2 feet from the fulcrum (the average distance) would be a weight pressure of 4 lbs., this being equivalent to a 2-lb. pressure at the extreme end. A 2-lb. weight at the end of the 4-foot arm of a 5-foot lever would raise 8 lbs. on the short arm. The paint weighed 10 lbs., and there was already a half-pound pressure on the short arm, making a total of 10½ lbs., which would require 2⅝ lbs. on the long arm to effect a balance. Therefore, the asbestos must have weighed ⅝ lb., or 10 ounces.

It is assumed, of course, that the weight of the paper bag was negligible.

## Solution to "A Question of Time"

AT 8 o'clock on the regulation clock, the hands are 20 minutes apart on the dial. The hands will be an equal distance from 6 when the descending minute hand and the ascending hour hand have together covered that intervening 20 minutes distance. The minute hand will cover 12/13 of the distance, and the hour hand 1/13, which brings the minute hand to a point 18 and 6/13 minutes past 8.

That a.m. time is 9/26 of the 24-hour day, and 9/26 of the 10-hour day is 3 and 6/13 hours. Therefore, the hands on the decimal clock, to correspond with the time shown on the regulation clock, should be placed to indicate 3 hours, 46 2/13 minutes, or 46 minutes and 15 5/13 seconds past 3 o'clock.

## Prize Winners in April Contest

First Prize of $10 is awarded to Paul R. Furr, Box 331, Stillwater, Okla.

Second Prize of $5 is awarded to Joseph Anselmo, 349 East 32nd Street, New York City.

The ten prizes of $1 each are awarded to the following:

George Sergent, Apartado 238, Tampico, Mexico.

Iantha Silence, Avoca, Iowa.

Hugh Borland, 1347 N. Dearborn St., Chicago, Ill.

D. D. Carr-Harris, 445 Piccadilly St., London, Ont., Canada.

Max A. Madison, 523 Kearsarge Ave., Ridgway, Pa.

A. M. Matheson, 131 67th Street, Niagara Falls, N. Y.

Samuel A. Sloan, 745 Chislett St., Pittsburgh, Pa.

P. M. Ginnings, 414 Northridge St., Greensboro, N. C.

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# "The Boss Was Stumped"

"He was trying to figure out a way to speed up the machines. I could see he was stumped and I asked him if he would let me try my hand at it.

" 'Go ahead,' he said, 'but I don't believe you can help much. Looks like an outside job to me.'

"So I started right in and pretty soon I had the whole thing worked out. The boss was watching me and I could see he was surprised.

" 'How did you learn all that?' he asked in that quiet way of his. And then I told him I'd been studying at home nights through the International Correspondence Schools.

"He didn't say anything more and I thought he had forgotten all about it until he called me in his office a few weeks later and said he was going to make me foreman and increase my salary $75 a month."

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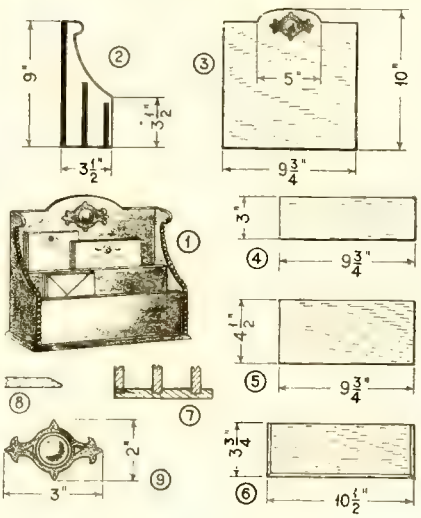
## Construct a Stationery Rack

OAK of ¼ inch thickness should be used for the stationery rack sketched at 1, which is made with two ends, 2, back, 3, front 4, division, 5, and bottom, 6.

The ends are shaped as shown. A rebate, ¼ inch wide by ⅛ inch deep is cut




at the back edge for the back; a groove, ¼ inch wide by ⅛ inch deep is cut ¼ inch in from the front edge for the front, and a similar groove is cut in the middle for the division, as at 2 and 7.

The front and division are glued into the grooves, the back is pinned in the rebates, while the bottom, which should have its front and end edges rounded over as shown at 8, is pinned to the edges of the ends, back, front and division.

For ornamentation, strips of ¼ inch turned shot beading are fixed to the front edges of the ends, and a fret of 1/16 inch wood, cut to the pattern shown at 9 with a 1 inch turned button, is fixed to the back.

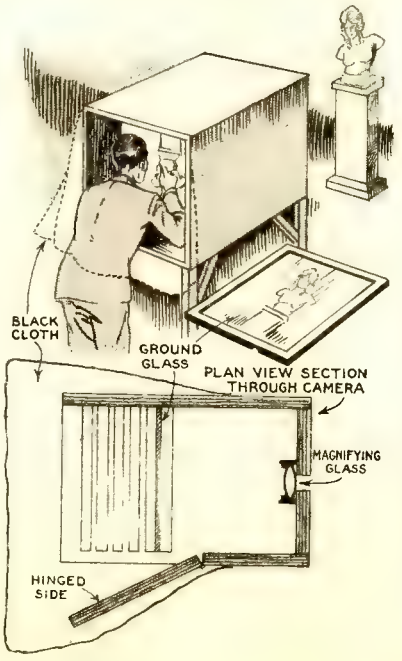
## Sketching on Ground Glass Plate

THE draftsman invariably sketches a machine or construction free hand while viewing the device. Sometimes rough measurements are made to insure accuracy and to make the picture somewhat identical with the model.

It is possible to save time and improve the accuracy of the drawing, by resort to a ground glass camera, which is readily made up along the lines shown in the attached sketch.

A box is used, with one side hinged. Guides are provided for a piece of ground glass, which is adjustable to focus. An ordinary small magnifying glass, is placed behind a small bored aperature in the front of the camera. A black covering is made and secured to the box, so as to exclude the light around the draftsman at the open end. The drawing is made on the plate in indelible pencil and is taken off by moistening a piece of drawing paper and pressing this against the face of the glass.

Regardless of the intricate parts of a machine, complete views, accurate detail and proportions can be obtained by this means.




## An Automatic Viscosimeter

IN order that you may have a dashboard indicator of the body and strength of the oil in your car, an automotive engineer has recently designed an instrument called the "automatic viscosimeter." A small portion of the oil which is delivered by the pump of the engine lubricating

Courtesy American Viscosimeter Company

system at varying pressure is diverted into a regulating chamber through a pressure-regulating valve. From the regulating valve. From the regulating chamber in which the oil is maintained at a constant pressure, P1, it flows into a measuring chamber through an orifice, D3. From the measuring chamber the oil flows at a constant rate through a friction tube or capillary tube. Owing to the friction in this tube, there occurs a loss of dynamic pressure which is proportional to the square of the velocity of flow. The capillary tube discharges into the crankcase, which is at atmospheric pressure. This is taken as the reference pressure and is put equal to zero. The pressure in the measuring chamber, which is the pressure gage on the dash, is equal to the pressure drop through the capillary tube.

The pressure guage may be calibrated in absolute viscosity units; or, for use on stock cars, it may be provided with a dial showing ranges of subnormal, normal, and supernormal viscosity. This dial is usually placed on the dashboard so as to serve as a visual indicator to the driver.

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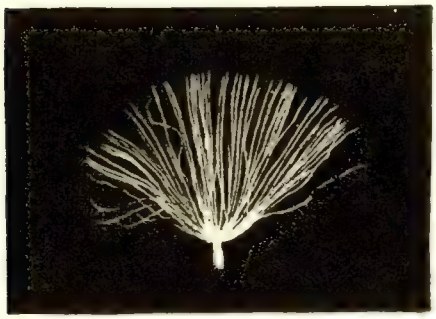
## Parachutes in Reverse

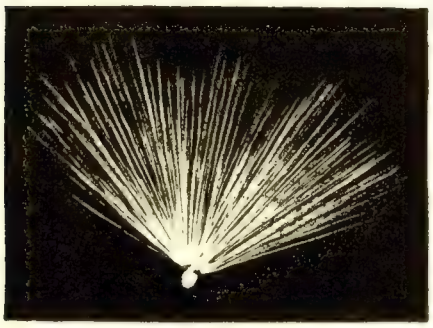
By F. E. Loudy,
*Aeronautical Engineer*

WE have gotten hold pretty well of the principles of motored flight in heavier-than-air machines, and we are de-developing the art of gliding to a point where we can soar for considerable distances and periods. But perhaps the most efficient form of flight as yet remains untried. I refer to the form which characterizes the anemophile or winged seed of certain common plant growths.



*Anemophile of rattlesnake weed.*

The illustrations accompanying this article show three varieties of anemophiles. If the vertical velocity of the wind is greater than the sinking of these seeds, they will rise. Here is a table of their sinking speeds:



*The lance-leaved thistle's anemophiles look like this.*

| | |
|---|---|
| Rattlesnake weed | .33 feet per second |
| Lance-leaved thistle | .60 " " " |
| Dandelion | .75 " " " |

The eagle, hawk, and buzzard have sinking speeds, in soaring flight, of 1.5 to 2.0 feet per second.

Since man has succeeded in reaching an altitude of 8,000 feet in a sailplane having a sinking speed of 1.75 feet per second, it is reasonable to believe that in a large anemophile of proper construction he might travel vertically upwards.

*Here are the winged seeds of the common dandelion.*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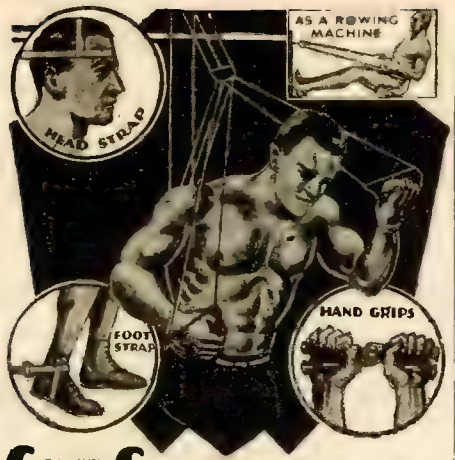


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# Master of the "Whirlwind"

## By Alfred M. Caddell

(*Continued from page 203*)

all his experimentation was to stand him in good stead. When he had finished with it, the motor ran smoothly, efficiently and without burning up—the bugaboo that had pursued other engineers. The motor developed sixty horsepower—the ancestor of the famous nine-cylinder radial Whirlwind was born.

This motor saw a little action during the war, but the conflict ended before it had the opportunity to thoroughly prove its value. Right after the war, however, the United States Navy ordered 450 of the Lawrance engines, then known as Model J's, and that official recognition gave Lawrance his first real start. He borrowed sufficient capital to organize the Lawrance Aero Engine Company, and after completing the government order, he started to develop two nine-cylinder engines, one of 175 h.p. for the Army and the other of 200 h.p. for the Navy. A little later he made the first model of the J-5, which developed 200 h.p. and weighed only 475 pounds. His knowledge of stress analysis, alloys, lubrication necessities, cooling, and the other hundred-odd factors that enter into successful motor design commenced to find their true expression. Success was beginning to follow in the wake of his efforts. The Lawrance Aero Engine Company was bought by the Wright Aeronautical Corporation and Charles L. Lawrance went with the latter company to guide its destinies into world-wide fame.

*Front view of the famous Whirlwind radial motor, cut away to show master rod and piston.*

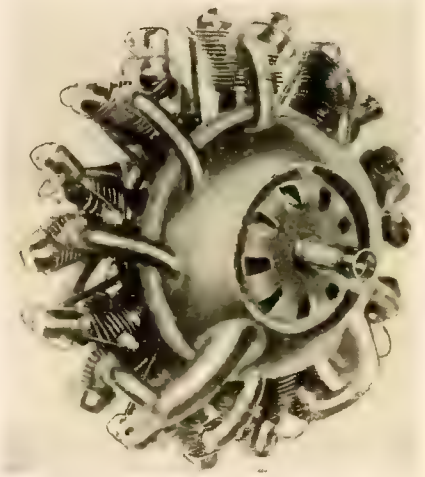
So much for Lawrance's achievements—if properly detailed they could not be told outside of a book. Even at that, he looks upon his experiences as being purely elemental, so great is the field for improvement in power plants.

"I like to think that it will be possible to produce an airplane engine of low frontal resistance and light weight, operating on the turbine principle, wherein every movement of each part will produce transmittable power," he said. "That is not true of the present gasoline engine, which is designed basically upon the reciprocating principle.

"The turbine principle is the ultimate toward which we should strive. Whether it can be converted for airplane use is a matter of long and elaborate research, but it is the most attractive of all engineering principles."

Contrary to some popular as well as engineering views on the subject Mr. Lawrance is not at all impressed with the possibilities of the Diesel type of motor.

"Of all the power mediums which present themselves to us," he continued, "the Diesel is the least attractive because it is the most wasteful. In a Diesel engine approximately nine-tenths of the weight and strength is incorporated in the machine to produce each single power stroke. Thus each power stroke produces a point of high stress which is at one-tenth the movement of the engine. In the conventional Diesel engine the strength factors are thus carried nine-tenths of the time without producing power, in order that they may be present for the last tenth as the gas combustion occurs. This is obviously a wasteful design."



*The Whirlwind as it appears cowled and streamlined for installation in a plane.*

Oddly enough, Mr. Lawrance's first venture in aviation was not with motors but with a new type of wing, which was designed to give more lift. He sent his plans to the famous French aerodynamic engineer Eiffel, and Eiffel thought so well of them that he embodied the theory they exemplified in his book. That was in 1911, and when the war came both England and Germany used the Lawrance wing design on many of their fighting planes.

# Show the Knowledge of Physics

## By Raymond B. Wailes

(*Continued from page 245*)

made from the second test tube, by means of a U-shaped piece of glass tubing. This tube passes into the "B" chamber through a hole in a cork in the open end of the chamber. Another clay ball rests upon this hole. This second cork is perforated again and through this hole is placed the glass nozzle.

Wet all parts before operating, and pour water in the pump to "prime" it. On lifting the piston handle, the pressure within the "A" chamber tends to decrease, and the pressure of the atmosphere on the surface of the water in the "well" pushes this water up into the lift, or "A" chamber. On pushing the piston down, the pressure within forces the clay ball against its rest hole, closing it, thus forcing the water within into chamber "B." Another stroke of the pump takes in more water into "A" and forces it into "B." The air at the top of the "B" chamber is compressed and forces the water out through the glass nozzle.

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## A Cord of Concrete

By Ernest McGaffey

(*Continued from page* 204)

trail where the country has not yet been penetrated by automobiles. Modern engineering will make possible roads as high as the crow flies—roads tunnelled through mountains.

One of the most enthusiastic promoters of the enterprise, the Automobile Club of Southern California, has sent a path-finding party to map the route between Los Angeles and Mexico City. An experienced cartographer to chart the roads, a technician, a representative of the Mexican government, to facilitate progress through the Republic of Mexico, a cameraman to make a complete motion picture of the trip, and a radio operator were included in the group.

No matter how remote its camping place, whether high on the top of the Sierra Madre Mountains or in the low valley of the Colorado River, the party has maintained daily communication with Los Angeles. Data concerning climatic conditions and highway possibilities has been relayed back home by Bertram E. Sandham, radio operator, through a broadcasting set similar to that used by Commander Byrd on his North Pole flight.

### *Mexico City Principal Stop*

The expedition's program called for excursions within the Southern Republic to investigate the roads farther inland, with Mexico City as a starting point. Though the Automobile Club's trip has been concerned with the territory south of Los Angeles, up north steps have been taken to extend the highway from Vancouver to Prince George. And the finished intercontinental motorway will reach through British Columbia, Canada; Washington, Oregon and California in the United States; the States of Sonora, Sinaloa, Nayarit, Jalisco, Pueblo, Oaxaca and Chiapas in Mexico; the Republics of Guatemala, Nicaragua, Salvador, Costa Rica and Panama in Central America; and the Republics of Ecuador, Peru, Chile and Argentina in South America.

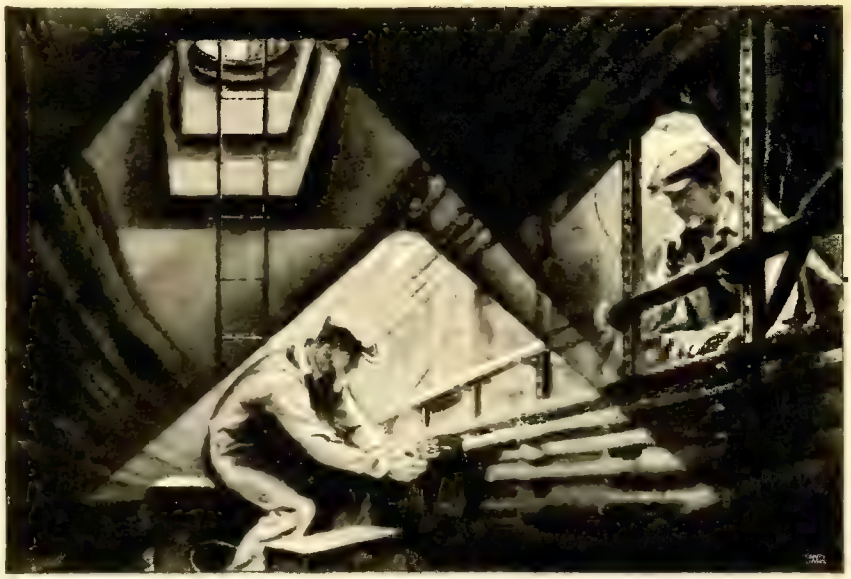
There are, of course, tremendous commercial possibilities involved, for South America imports approximately $1,220,000,000 of merchandise yearly. But aside from this, regions of great beauty and interest now sealed to the world will be opened up. Few of us possess any conception of the culture and grace of the people, the high state of civilization, that exist in Mexico and South America, and the fairyland of magnificent scenery which our cars will soon be able to penetrate.

## Home Television Is Here

By Auguste Vitrel

(*Continued from page* 237)

and the other, which is used for reception, is twenty-one inches in size. The use of the improved neon tube obviates the annoying pink light of the ordinary televisor. This lamp gives only a gentle blue illumination which is very soothing to the eyes. The detail of the picture reproduction is very good, but unfortunately, this system—being expensive and complicated—is a commercial proposition only; it is not designed for home use.

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# Aloft With the Bouncing Blimps

By William Watts Chaplin

(*Continued from page 205*)

of using lighter-than-air ships for shore-to-ship service. When the day of such regular service comes it will not be done with anything as small as the TC ships with their limited passenger and freight capacity. But the little blimps showed the way; let the big ones follow their cloud-strewn trail.

The next time I was assigned to a blimp story I rode in the TC-5. She and the TC-10 took off from Lakehurst, where they are accustomed to borrow lodging at the Navy hangar when in the New York district. At noon of a sunny Spring day. Across a blue sky the shining cloth ships bobbed and dipped in the air currents to their rendezvous beyond Ambrose.

Like millions of other people in the country I had seen these Navy ships and the J ships of the Navy flying overhead on numerous occasions and often had wondered how it felt to ride in one of them. Now I found out.

I had ridden in the great rigid dirigible of the Navy, the German-made Los Angeles which rides the sky in fair weather and foul as steadily as a winged hotel. I found the smaller ships a far different proposition. Hardly had we gained an altitude of five hundred feet and started above the pine woods of Jersey when the TC-5 ran into a downward current.

The Los Angeles is so big that it would have passed over this "air pocket" without a quiver. An airplane travels so fast that it would have gone over it with just one of those sharp bumps that do strange things to the inexperienced stomach. But the TC-5 went into it like a canoe riding a ground swell.

### *And Then . . .*

Our nose turned down and we swooped gracefully like a Coney Island chute-the-chutes car. The gondolas of these ships are hung underneath and are open. They are similar to a fisherman's dory, with sides certainly no higher, and the passengers sit on cushioned benches that run around the sides of the shallow cockpit.

Before taking off we had been ordered to put on parachutes and after my previous experience with the Los Angeles I had felt that the precaution was unnecessary. On that first swoop, however, the clumsy pack on my back seemed to me the finest invention in the whole roll of scientific achievement and I must admit that my hand involuntarily stole to the iron ring of the rip cord more than once.

The dipping motions of the ship soon, however, lost their novelty and after that I was able to enjoy to the full the roaring progress above land and sea.

We were early at Ambrose and for an hour we sat, with motors silenced, five hundred feet above the lightship. Spread below us were the world's ships arriving from strange ports and setting forth for distant corners of the earth. The steamer we sought hove in sight and we preceded her outward toward the watery horizon. When at last the Army plane approached we closed in.

The plane flashed above the steamer, banked steeply, and swung in a circle. Suddenly a stream of dense smoke began pouring from the plane and spreading in a visually impenetrable wall about the liner. The plane passed over the ship and the wall was ceiled. The TC ships squatted overhead, invisible to all on the surface and within that dome of smoke.

In five minutes or so the liner pushed its nose through the smoke and continued on its way, for this was just a game. But suppose it had been war? Suppose the small blimps had been great dirigibles like the ones now under construction for the Navy at Akron with planes to release at will from marsupial pouches. Would that steamer, no matter how fine its arsenal, ever have emerged from the bubble of smoke? Or would it have been riven in a thousand broken bits for all its steel frame by devastating explosives leisurely dropped from the cloth battle ships above?

---

# Fireworks for the Fourth

By William Lemkin

(*Continued from page 238*)

| | |
|---|---|
| Sodium chlorate | yellow |
| Potassium chlorate | violet |
| Calcium chloride | orange |
| Strontium nitrate | red |
| Barium nitrate | apple green |
| Copper nitrate | emerald green |
| Lithium chloride | vivid red |

Firework papers, which produce characteristic colors on burning, are easily prepared. A solution is made of the active, color-producing chemicals in alcohol and water. Unsized paper is put into the solution until it is thoroughly soaked. The paper is then removed and dried by hanging it over a string stretched across a warm room. A sheet of paper about 12 by 16 inches may be made to burn for several minutes. The formulas are:

RED

| | |
|---|---|
| Strontium nitrate | 20 parts |
| Potassium chlorate | 10 parts |
| Alcohol | 20 parts |
| Water | 100 parts |

GREEN

| | |
|---|---|
| Barium chlorate | 20 parts |
| Alcohol | 20 parts |
| Water | 100 parts |

YELLOW

| | |
|---|---|
| Sodium oxalate | 10 parts |
| Potassium chlorate | 10 parts |
| Alcohol | 20 parts |
| Water | 100 parts |

BLUE

| | |
|---|---|
| Copper chlorate | 20 parts |
| Potassium chlorate | 10 parts |
| Alcohol | 20 parts |
| Water | 100 parts |

### *Pyromorphic Carbon*

Pyromorphic carbon is a substance that is simple to prepare, and is ideally suited for a vivid pyrotechnic display because of its ability to take fire spontaneously. Mix solutions of lead acetate and tartaric acid to yield a precipitate of lead tartrate. Filter this residue, wash it and dry in the air. Next prepare a glass ampule by drawing out a test-tube in the Bunsen burner flame. Place a quantity of the powder in the ampule, and heat until no more white fumes are given off. Now seal the tube at the constriction before the mass cools. When the tube is thoroughly cooled, break off the tip, invert the ampule, and shake out the contents. The material will burst into flame before reaching the floor. The explanation for this phenomenon is that, on heating lead tartrate, it is decomposed, leaving lead and carbon. These elements are in such a finely divided condition that they react readily with the oxygen of the air, thus bursting into flame spontaneously.

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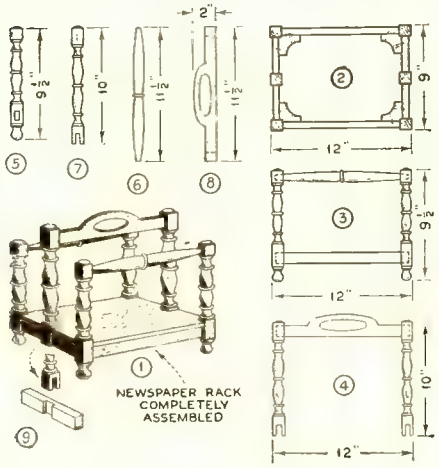
The familiar "Serpents' eggs," also known as "Pharoah's serpents," while not of the explosive and flashy character possessed by the other materials described above, are nevertheless a constant source of entertainment. The active ingredient is mercury sulphocyanide, which may be made as follows: Dissolve metallic mercury in dilute nitric acid by means of heat, taking care to have an excess of mercury present. Decant the solution, and add an equal amount of a saturated solution of ammonium sulphocyanide. Filter the precipitate, wash several times with water, and allow to dry. Mix this dried mass in a mortar with a little gum tragacanth to make a pasty mass, but as dry as possible. Roll the mass into little pellets in the form of pyramids, and cover each with tinfoil. Then put the eggs thus formed on a sheet of glass, and dry again, after which they are ready for use. When ignited the little pill will grow out into a long snake-like form, twisting and writhing in a most life-like and startling fashion.

## Make a Newspaper Rack

Those who possess a lathe will be interested in this newspaper rack. Nearly all the parts are in turned wood.

One of the hardwoods should be used, the following being required:—four corner uprights, 9½ inches square; two top rails, 11½ inches long by 1 inch diameter;




two middle uprights, 10 inches long by 1 inch square; one handle, 11½ inches long by 2 inches wide by ½ inch thick; four bottom rails for framing, two being 11½ inches long and two 8½ inches long by 1 inch wide by ½ inch thick, and a bottom 12 inches long by 9 inches wide by ½ inch thick.

The four corner uprights are turned to the pattern shown at 5, the two top rails as at 6, and the two middle uprights as at 7. The corner uprights are first framed up in pairs, each pair being joined by a top rail and a bottom framing rail.

The former is bored in and the latter tenoned.

The handle is shaped as at 8, and the two middle uprights are framed with it.

The four corner uprights which have been framed in pairs are joined by the two remaining bottom rails, and small fixing blocks may be fitted in the corners. The inner uprights are fitted over these bottom rails, but before they are finally fixed the bottom should be fitted over the framing rails and jointed around the uprights. The bottom is screwed through the rails, while the uprights may be fixed from the inside through the framing rails.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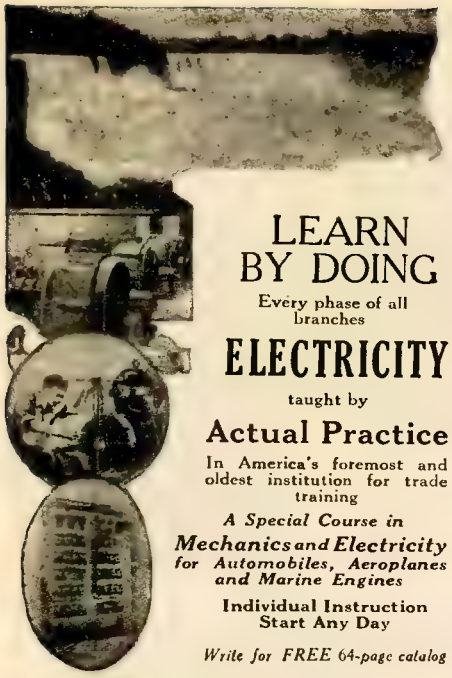

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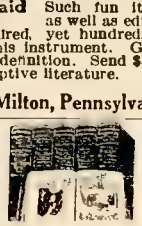

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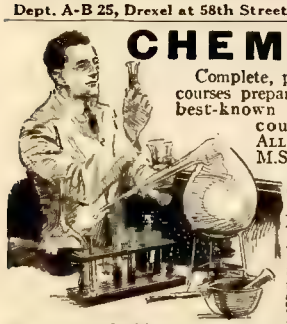

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# Funnels of Terror

By B. Francis Dashiell

(*Continued from page* 209)

was 1927. In this year 164 tornadoes were reported, the largest number of record. But the total number of lives lost in 1927 was only 540. It just happened that many of the tornadoes did not cross densely populated regions. Almost as many lives were lost as far back as 1896, when 520 persons met death in only 66 reported tornadoes. The largest toll of human lives taken by tornadoes occurred in the year 1925, but only 119 tornadoes were reported as compared with 164 in 1927. The number of tornadoes reported has no direct relationship with the number of lives lost; it is simply a matter of luck whether the tornadoes pass over towns and cities, or the open country and prairies.

The steady increase in the number of reported tornadoes has been blamed on many things, but always without the least merit or foundation based on scientific facts. The first railroads across the plains were once reputed to be the cause, as the iron rails were believed to attract the storms and lightning. Then came the problems of farming and deforestation and physical changes in the characteristics of the landscape. Today many people are blaming the radio, sunspots, and whatnot, as the causes for many unexplained weather situations. These are all idle fallacies. Tornadoes have always been associated with certain weather conditions; they will continue to come as long as the weather exists.

Tornadoes, or twisters, as they are more popularly called in parts of America, are the most diminutive, dangerous and destructive of all storms known on earth. They are common to the Mississippi Valley region of the United States, but can, and often do, appear elsewhere. It is only necessary that the proper type of parent cyclone be present.

## *The Greatest Tornadoes*

The greatest tornadoes very rarely reach 1,000 feet in diameter or travel a path more than 25 miles in length. The parent cyclone may be as much as 1,000 miles in diameter, and travel along a path many thousands of miles long. Cyclones are easily recognized by their cloudy weather, moist winds, and copious rainfall. When such a storm develops over our southern states its normal path will be toward the northeast of its center. This will usually bring the storm up the Mississippi and Ohio river valleys. Coming along in the storm area is a region of thunderstorms and associated tornadoes, the southeastern sector of the circular cyclonic area. Whenever this dangerous portion of the storm passes over the point of observation there will be thunderstorms and, perhaps, one or more tornadoes of various intensity which cannot be predicted as to location or certainty of movement.

A tornado in the making is an interesting and awesome sight. Toward the close of a spring or summer day, after much cloudiness with increasing heat and sultriness, the clouds become darker and darker. The air is still and the muttering of thunder becomes louder as the vivid displays of lightning increase in frequency. Now the clouds, which have been rapidly thickening, seem to be in a turmoil as they come lower and closer to the earth. Suddenly, taking on a ominous greenish-black appearance, they seem to be whirling about and rushing in from every direction. Drawing down from the overhead maelstrom of clouds is a madly whirling pendant or vortex, dipping and pointing down to earth like some sinister finger. It is a gigantic whirlpool of rushing air and blue-black clouds. Infrequently the sky will be covered with a number of pointing fingers of clouds which do not come down very far, but all of which are potential tornadoes. These seldom have sufficient energy to develop into real tornadoes.

As we watch with spellbound eyes we see a great funnel-shaped cloud, steadily dipping down and down until its lower tip touches the earth. If the lower part is large in diameter and intense in activity, it frequently will hang straight down from the overhead clouds. But usually it drags to one side or in the rear of the overhead cloud connection, writhing about like some gigantic snake in agony. The tip of the long funnel, where it touches the earth, is slightly enlarged and pulled out of shape by the resistance of the earth.

The funnel cloud of a tornado travels in the same direction as the overhead storm clouds, which are rotating in a great circle about the center of the cyclone. On the side of the cyclone where tornadoes occur the upper cloud direction is always from the southwest toward the northeast. Tornadoes, therefore, always move along paths toward the northeast. The speed, or rate of progress, of the tornado is the same as the upper cloud travel. But the tornado is spinning around like a top in the meanwhile, so its motion may be likened to that of a spinning top as it slowly glides across a floor.

The speed of the whirlwind of air in the funnel is believed to reach nearly 500 miles an hour. In addition to this rotary velocity there is an upward flow or draft of air reaching from 100 to 200 miles per hour. Contrary to belief, the tornado funnel cloud is not entirely created by the pulling down of the original overhead clouds of the storm, but by the density of clouds of moisture condensed from the air by its rotation. The addition of dust and debris in the funnel will give it a very black appearance.

## *The Roar of a Tornado*

The roar of a tornado is so loud that the sounds of crashing buildings may be drowned out. Much of the destructive action of tornadoes is not due entirely to the straight blowing force of the winds. Buildings actually explode! The reason for this is quite simple. For instance, a water whirlpool in a stream is hollow because of the fact that its rotary action and centrifugal force throw the water away from its center out toward the rim. A similar effect is produced in the spinning tornado funnel cloud; the center of the funnel is comparatively a vacuum.

Should a house, having the usual or normal air pressure within, be immediately surrounded by the partial vacuum of a passing tornado funnel, a condition of two adjacent unequal air pressures exists. The pressure of the air within the building greatly exceeds that of the outside air and, because the inner air is unable rapidly to leak out through the windows and doors to balance conditions and fill the void without, the building must explode outward. The roof goes up, and the walls, doors and windows go out in all directions.

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Then the suction and whirling forces of the tornado complete the destruction. Fragments of the structure are carried up into the funnel and scattered over the countryside for many miles after the force of the tornado has spent itself.

The partial vacuum and suction effect of a tornado plays many pranks. Soot is blown upward from chimneys when storms are not powerful enough to demolish houses. Corks will frequently pop out of bottles which have some air within. Sealed boxes and trunks have been known to explode, worn automobile tires burst, and sudden and painful personal sensations are occasionally experienced.

The force of the wind is terrific. Straws are sometimes blown end-ways into the bark of trees. Similarly, sticks and laths have been forced into or through boards. Wagons, machines and small structures have been known to be carried far off and deposited gently and safely. Even chickens have been stripped of their feathers although otherwise unharmed. Trees are generally denuded of their leaves and smaller branches. Birds are gathered up into the funnel and carried along with the dust, sticks, leaves, and wreckage for miles until the fury of the winds have abated. Sometimes tornadoes will rise and pass over places along their paths, only to descend again to earth and bring additional destruction. The edge of a tornado path is rather well defined; a house in its path will be totally demolished, while another, perhaps less than 25 feet away, will remain undamaged.

Because of the rapidity of the approach of a tornado there is little time to escape it. However, when the cloud is observed at some distance, and its direction of travel can be noted, it is possible to seek shelter or to sidestep its path when in the open country. Many persons living in tornado belts have outdoor cellars or caves into which they rush at the first signs of a tornado. As a building is likely to be instantly demolished, refuge in one is always precarious. For the lack of a better place to seek safety it is best to go into the far southwestern corner of a cellar or basement with some temporary overhead shelter, as the wreckage will tend to go off toward the northeastern side of the building. A house with wide-open doors and windows stands a better chance of escaping total destruction than one tightly closed. The fact that tornadoes usually come in the daylight of late afternoons provides people with opportunities to observe them and seek shelter.

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# A White-Hot Storm of Sleet

By J. W. Hammond

(*Continued from page 220*)

Technology will have the largest telescope in the world. The new process makes it possible to fabricate telescopic mirrors of a size hitherto out of the question. The mirror aimed at for the California institution will have a 200-inch reflecting surface, will weigh almost thirty tons, and will occupy a good-sized room!

This telescope (the size of a telescope is defined by the diameter of its reflecting mirror) will be twice the size of the present record holder—the great reflecting telescope of the Mount Wilson observatory, perched 5,700 feet above sea level. Large enough, it would seem, to disclose the secrets of heaven—in reality, large enough for astronomers to study heavenly bodies 750 *quintillion miles away!* With the new 200-inch disc they will be able to gaze at star groups *two sextillion* (2,000,000,000,000,000,000,000) *miles away*—the light by which they will be visible will have started on its journey through space four million centuries ago!

For thirty years Professor Elihu Thomson has been experimenting with quartz. Quite early he realized its superiority to glass for telescopes. For glass presents great difficulties. All glass must be annealed to prevent its cracking spontaneously because of strain by the manufacturer. Small and thin articles like tumblers are comparatively easy to anneal; but it is a prolonged process for the great disc of glass, weighing several tons, designed for telescope use. Annealing quartz is a much simpler process.

Glass is very sensitive to change in temperature, expanding with heat. The flame of a candle held against an astronomical mirror distorted the image of a star, Professor Thomson discovered, while it did not affect the focal image on a fused quartz mirror.

### *Experimenting with Quartz*

Research enabled Professor Thomson to produce tubes of molded forms of quartz by surrounding a shaped carbon conductor with sand and passing an electric current through it. Now large quantities are fused in electric furnaces, at a temperature of over 3,200° Fahrenheit, to obtain a rough disc of the desired shape and thickness.

Then a perfect layer of melted quartz was needed to cover the rough disc, in order to obtain the proper curvature for reflecting the light of the stars accurately. Short rods and little slabs were melted on the disc without success—their outlines were discernible. Finally Mr. Ellis of the Laboratory staff thought of spraying its surface with finely powdered quartz, blown through an oxygen-hydrogen burner. Ridges were eliminated—but specks, streaks and foreign substances remained—every blemish had to be removed by persevering experiment before the coated disc could be annealed and ground into shape and polished by the regular process. Then an inconceivably thin layer of silver was applied. The curvature of the finished Thomson fused quartz disc is accurate within a few millionths of an inch!

Already about twenty discs up to two feet in diameter have been constructed as samples. They have proved entirely satisfactory and will serve as finders to locate heavenly bodies before their rays are reflected in the 200-inch mirror of the monster telescope. More discs are being made, their size increasing step by step toward the final dimension set.


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## IN AERO NEWS AND MECHANICS

### *for June-July*

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*Capt. Robert A. Smith,* Manager of Fairchild Aerial Surveys, Inc., tells most interestingly of the troubles that beset the pioneer aerial photographers, taking us through the war days right up to the present.

*A most comprehensive story* about the possibilities of steam power for aircraft has been prepared by Alfred M. Caddell, who has investigated the field for this little known power plant.

*"Vacations in the Air"* carries its own appeal, and inasmuch as this was written by Capt. Frank M. Hawks, holder of both the west to east and east to west trans-continental air records, it may be depended upon that this story is good.

*Capt. Lewis A. Yancey,* of trans-Atlantic flight fame, has gone thoroughly into the elements of flying meteorology, and when we have an expert to diagnose weather, the chances are that the reader will learn something about it.

*"Flying the Timber Trail,"* by James Nevin Miller, is a most interesting account of the forest fire air patrol.

*And "Dawn Patrol"*—a true story of the Royal Flying Corps in the war, simply takes the reader's breath away.

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# Do You Speak English or American?

## *A Cross-word Puzzle by* RICHARD H. TINGLEY, C.E.

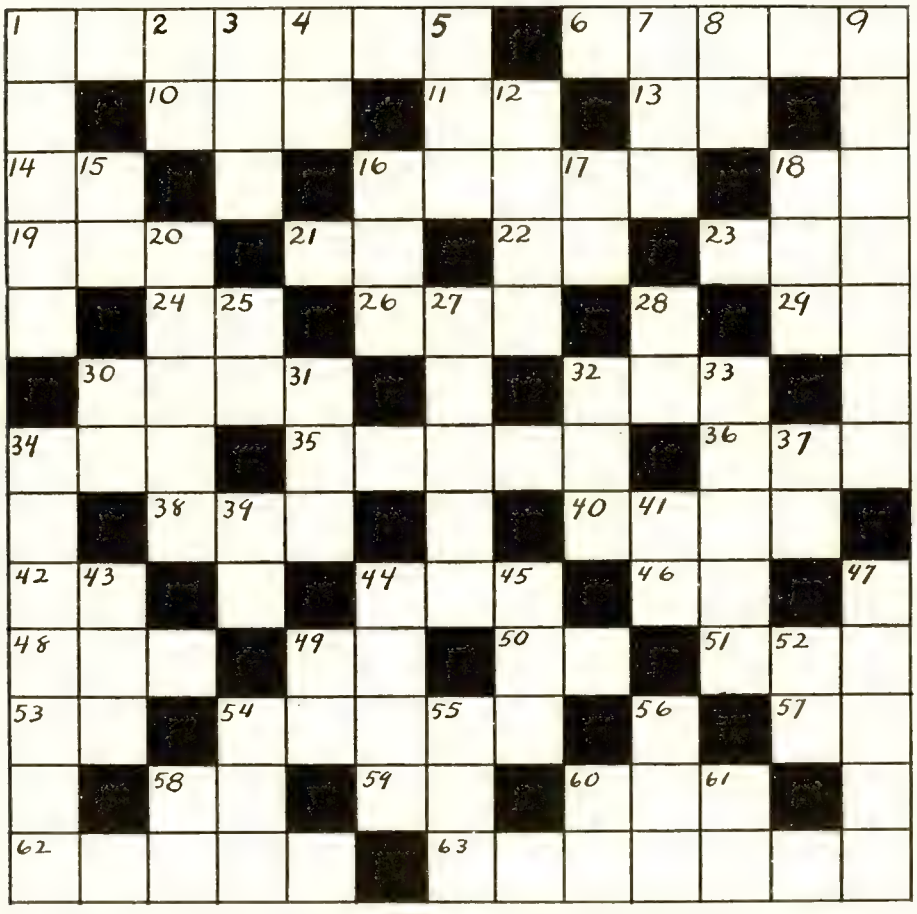
**In This Puzzle the Difference Between the American and English Spelling and Definitions of Words Is Brought Out**

### ACROSS

1. In the United States a drug store is kept by a druggist: In England the keeper of a drug store is known by this name.
6. Our British cousins haven't yet discarded the diphthong from this word which means "eternity" in the plural if, indeed, there is a plural to such a term.
10. In our country we speak of certain preserved foods coming in a "can"; the British use this three-letter word instead.
11. Egyptian sun god.
13. Abbreviation for "Recording Secretary."
14. Of, or from; a French preposition.
16. A filament composed of, or separable into threads. Englishmen haven't yet abandoned the awkward termination of this and of many like words as we have.
18. Four years after the First Crusade started.
19. An imaginary being superstitiously supposed to inhabit unfrequented places; a sprite.
21. An interjection intended to describe a meaningless utterance, synonymous with "uh" or "er," etc.
22. The base of one of the most irregular verbs in the English language. Nobody has yet been able to discover a better definition for it than "exist."
23. One's medical adviser (very familiarly).
24. Chemical termination used to express the presence of alcohol in various compounds.
26. A frequent termination of names of groups of animals of no determinate rank in the classification scales.
29. A Japanese grain or liquid measure, a little less than half an English bushel.
30. A definite space.
40. A division or segment.
42. Abbreviation for a cask containing 42 U. S. gallons as used in America, but 36 imperial gallons as used in England.
44. A Chaucerian expression for "guide."
46. Abbreviation for the scene of Cæsar's commentaries.
48. In British colloquialism "to flatter." In United States vernacular the word is equivalent to the slang phrase "to jolly."
49. The eighteenth letter of our alphabet.
50. The date of death of a person. A Latin word much used in England in this abbreviated form.
51. A Biblical high priest.
53. A technical definition in abbreviated form for a power capable of raising a weight of 550 pounds one foot in a second of time.
54. We broke away from the English practice when we adopted a new spelling of this word which means "exhibits" or "displays."
57. Abbreviation for the lowest rank of the British nobility.
58. A degree.
59. You.
60. A piece of ground containing 1,076.4 square feet—Metric system.
62. Short and thick; we don't spell it this way in America.
63. When you put your name on the back of a check you do this, but we spell it differently here in the United States.

### DOWN

1. The juice of an apple would look unfamiliar to us if we spelled it this way as they do in England.



32. Englishmen are accustomed to use this word where we of the United States would say "hotel."
34. A word from the Swedish or Norwegian "kagge," meaning a round mass or heap. In England and this country it means a small cask which, as Dryden says, "Gives many a dainty bit out of his lusty jowl."
35. In the United States we write this word with four letters and spell it quite differently. It means a "little bottle." We give the British spelling.
36. An abbreviation for "irregular."
38. Unabridged dictionaries devote a page or two to the many colloquial and other definitions of this little three-letter word, sometimes a preposition, sometimes an adverb. The best definition is the reverse of "in."
2. And; in French and Latin.
3. An English dialectic form of "man."
4. A preposition and adverb, commonly used to express relationship of time, of place, of being.
5. Prefix denoting "three."
7. A preposition meaning before the present time, or formerly.
8. Latin for "bone." We use it in compound words.
9. Help or relief rendered in distress. We have dropped one of the redundant vowels from the word as we have with many others like it, but the English have not.
12. A Syriac word for father used in the New Testament.
15. A diminutive in words from Latin or French.

(*Continued on page 278*)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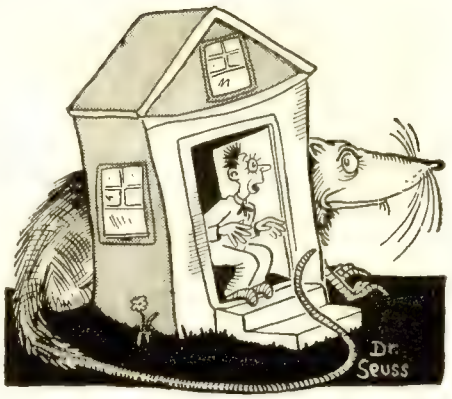


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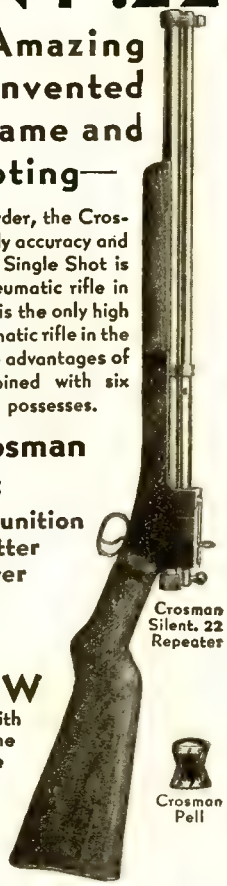


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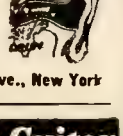

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## As Simple as A-B-C.

By Count A. N. Mirzaoff

(*Continued from page* 211)

felt. Town after town on the Mediterranean shore today shows by its name that the branch office once established there by the crafty Phoenician soon developed more influence than the city hall—or whatever the center of political influence may have been called at that early date. And in his search for raw materials to supply his markets, he went beyond the bounds of Europe and came sailing back with British tin. Exactly how he acquired it is not recorded, but since the Britons were a simple people and rudely armed, we may safely imagine that the bargain did no injury to his reputation as a man of sound business sense.

Apparently the Phoenicians found it necessary in the course of their commercial operations to establish a system of coinage and credits—in other words, to go into finance on an international scale. It is surely logical to believe that this most enterprising people was after all the real inventor of the phonetic alphabet. No other people of the time had so sharp a need for a means of accurate written communication. No other people of the time made its living in a way as likely to develop wit and ingenuity. No other people had so great an incentive for resourceful action. When one surveys and measures the candidates for the honor of making the great leap from the pictographic to the phonetic, one must admit that Cadmus, the pirate penman, leads by a sword-length at least.

The first letter of the Phoenician alphabet is called "aleph," and signifies "ox." This, with other clues (like "cheth," the eight letter, which signifies "fence;" and "lamed," corresponding to our "l," which signifies "whip"), seems to indicate that Cadmus orginally was a herdsman—an occupational type famous for its predatory tendencies since the dawn of history.

It may be that the Phoenicians had built up a considerable business on land before they found in the sea an opportunity to widen the scope of their enterprise.

The very word "alphabet" is Phoenician in origin. It is a combination of "aleph" and "beth" (dwelling), the first two letters of the Phoenician character system. When the Greeks took over the first character they mispronounced it "alpha," and represented it wrong-side up, not seeing that it derived from a drawing of the head of an ox. So the alphabet as we know it begins with a double mistake, which may be sad news to romantic admirers of "the wisdom of the Greeks."

It will be noted that the Greeks, who adopted the Phoenician alphabet without hesitation, were, like the Phoenicians, a seafaring, trading, piratic people. The fact that they faced the same emergencies as the Phoenicians doubtless enabled them to see the advantages of the Phoenician system immediately.

### *Eeny-Meeny-Miney-Mo*

That's no more ludicrous than what doctors of centuries ago used to say to drive away sickness. . . . Read about it in SCIENCE AND INVENTION for August.


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# Millionths of Inches

By W. A. Simonds

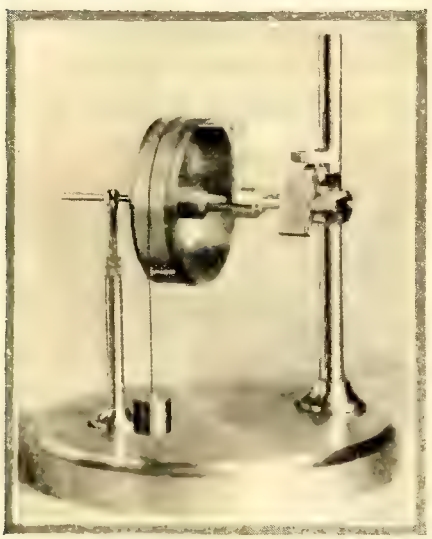
(*Continued from page 214*)

Today they serve as the standards of comparison—the master inch—in Washington, D. C., Paris, London, Ottawa, Berlin, Berne, and Leningrad, in the headquarters of every national bureau of weights and measures.

One of the most interesting stories of Johansson's achievement is in connection with the machines which he evolved to test his own accuracy during the time he was developing his gage blocks. No tools existed at that time able to check such a high degree of accuracy as he proposed, so he had to invent his own. He did that by enlarging the thumb and spindle of an ordinary micrometer. Starting with the vernier scale, he devised an instrument which would measure within 4/100,000 of an inch, ample for his needs at that time.

Taking a micrometer, he amplified the readings of the vernier scale, placing them on the circumference of a drum. When a block was ready for measuring or testing, he placed it between two jaws, one of which was rigid and the other could be opened or closed by turning it forward or back as in the case of a micrometer. A suspended weight equalized the pressure.

Another device that came a few years later was invented by him to detect variances by means of a thin film. Six rods were used, held upright in a frame in a sort of triangular pile. Those in the corners were of a known measure, while in between them were placed loose rods, ready for checking. After the latter were in place, he rubbed his finger over the ends of the six rods, leaving a thin film.



*A drum containing an amplified vernier scale, with a weight to equalize the pressure, was used to check the first Johansson gage blocks.*

If the rods were identical in length, their ends were even and a straight blade laid across them would leave a mark in the film on each end. Should one be too short, it would not show the line; and if it was too long, it alone would be marked, the others showing no trace.

Today, of course, much more accurate machines are used in checking precision tools, but those ancestors of today's fine workmanship deserve some mention because of their simplicity and effectiveness, as well as testifying to the ingenuity of the inventor.

Use of these blocks has brought into mass production the idea of "limit manufacturing," allowing a certain degree of tolerance for finely-made parts, yet capable of fitting and serving as desired. Blueprints show not only the dimensions of each part, but how much *under* and how much *over* the exact dimensions the part might measure and still be susceptible to assembly.

That system has now become almost universal, thanks to Johansson and his blocks. Along the assembly lines the workmen use gages that have two measures—one being the high limit possible to the part and still fit; the other being the lowest limit that can be allowed and still fit. The variance between the "high" and "low" may be only a few ten-thousandths of an inch, but it is sufficient to allow for the human element—the fact that no human being nor two human beings can make two things that will be exactly alike to an infinitesimal degree. Such fine tolerances make allowances for this human failing and still make precision possible, for the fit must be close whatever the differences between the two parts.

*To check the length of rods, Mr. Johansson developed this device, in which the film left by a finger-end served as the recording medium.*

Today, in many large manufacturing plants, mechanics who never looked through the eyepiece of a microscope are measuring within limits too fine for any unaided eye to see. In the gage inspection rooms, the supreme court of accuracy, instruments may be found capable of magnifying a human hair to a width of more than three inches. There is no time in the rush of assembly for hand-fitting of inaccurate parts. They must fit the first time.

There are inspection and working gages to measure outside and inside diameters, lengths, widths, heights, angles, pitch, diameter and lead of screw threads, and so on—and in the background are the master gage blocks which keep the production gages accurate, for they wear or get slightly out of adjustment under constant use. Four hours is the life of more than one production gage—after that it must be taken off the line and checked. Close limit gages are checked as often as three times during a single eight-hour shift.

And it is a fact that one of the largest manufacturing institutions in the world holds its master gages to an accuracy of plus or minus four-millionths of an inch; and its Johansson gage blocks are retired from active use when a wear of ten-millionths of an inch develops.

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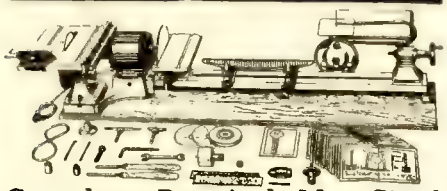

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# Does Your Home Lack Harmony?

By Mary Jacobs

(*Continued from page 239*)

grayed colors serve as backgrounds because they are restful. In addition, varying intensities of complimentary colors (for example red and green) may be used in the same room.

Quite often walls may be used to blend the various color effects of a room. Here white, neutral and soft shades allow a great variety of colors in furnishings. The lighter the color value (as cream) the more spacious will a room appear. . . . The plainer the wall finish the more chance for furniture and rugs to express variety through patterns. Figured wall paper (especially large figured) detracts from the room's size: upturned curves give life; vertical panels and stripes create an illusion of height.

Courtesy Flint & Horner Co., Inc.

*Colonial furniture of simple design gives a comfortable and restful effect.*

The walls and woodwork may be the same color, or the woodwork a shade darker; the ceiling, since it really is an extension of the wall, should be lighter than the wall; the floor should be darkest of all. Sunny rooms need darker walls than those requiring added light. Plain walls can quite often be improved with a few colorful pictures hung at eye level, wherever the furniture underneath permits.

## *Floors and Furniture*

Floors act as a base for the room. The plainer their covering the larger the room appears . . . so too, while one large rug seems to give an illusion of space, several small ones depreciate size. Placing a rug parallel to the lines of a room promotes harmony. Small rugs with curved designs provide an air of buoyancy, diagonal patterns suggest action and crispness, and many figured rugs (such as Persian) give an effect of movement.

To balance a room both large, heavy pieces of furniture and small ones are necessary. Place the former first and balance them symmetrically. Usually they look best parallel to the wall. The smaller pieces can be conveniently grouped later. Quite often you can create a definite atmosphere, through the shape of chairs, sofas, pillows. Straight lines in furniture suggest steadiness, curved motifs, flexibility; vertical lines connote life, horizontal ones, repose. A combination of all is best and prevents monotony. If a chair is too low and broad a vertically designed cover will counteract its effect. Very tall chairs add dignity, a low, long sofa suggests informality, an open bookcase, friendliness.

Many people have discovered to their chagrin that furniture, which fitted one room, seems entirely out of place in another, when they moved. Recently a friend of mine moved into larger rooms. . . .


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## IN AMAZING STORIES

### *for July*

*"The Message From Space,"* by David H. Speaker. Selenium, we know, has strong photographic properties. But all the elements, even in the accepted table of elements, have not yet been discovered. How, then, can we be assured that some new element, more remarkable than selenium for its photo-electric properties, may not be discovered—an element strong enough to make possible enormous distance radio communication? It is a story of unusual scientific interest.

*"The Driving Power,"* by Miles J. Breuer, M.D. Probably when we have all completely assimilated the new theory of the structure of the Schroedinger atom, we may have to start learning new theories about atomic structure. How, then, can it be definitely said what the powers of intra-atomic energies may be? Dr. Breuer has done the unusual once more in this story of literary merit and scientific interest.

*"Paradox +,"* by Charles Cloukey. In answer to numerous requests, the sequel to "Paradox" has finally arrived.

*"Flamingo,"* by Clarence Edward Heller. Much has been said in the daily journals of wonderful robots, the direct successors of the almost historical "steam man" of two generations ago. But think what would happen if not only the servant and the manual worker were replaced by robots—if even our great singers and famous actors were likewise replaced in such manner. Read this charming extravaganza of the amusements of the future.

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Grouping the small pieces, she found, emphasized the bulk of the group instead of that of each item, and helped create interest centers. She has an open fireplace in her living room. Above it is hung an attractive picture, on each side is placed a facing chair, too small for individual treatment. Your eye naturally was guided to this fireplace group.

One or two pieces of brightly painted furniture are adequate for brightening a room—an end table, a small chair, a lamp. A vase of flowers or a plant will achieve the same effect. A touch of black in your rug, on a lamp base, or on the exterior of a flower pot also serves to show up bright colors.

A hard center light both injures eyesight and detracts from coziness . . . soft, diffused lights, from wall brackets and lamps, soften a room, as do certain colors when used for glass-curtains (those through which light can penetrate). Soft orange, pale yellow, and ivory both soften and warm a room.

Together with the walls, ceiling and floor, curtains and draperies comprise the background for furniture . . . whose charm they can enhance, whose deficiencies they often disguise. For example, if the furniture lacks dignity, heavy and rich draperies (such as velvet) will provide it; if the ceiling is too low, upward angles add height; if too high, a straight valance will counteract the effect.

## Which Type Are You?

By Edward J. Beck

(*Continued on page* 215)

"The asthenic is abstemious, dyspeptic, with a tendency to tuberculosis and when insane, schizophrenic, that is to say, prone to fixed ideas, ideas of persecution, etc.

"The pyknic is rubicund, rotund, large-bodied, short-limbed, broad enough through the chest but broader through the abdomen with a round or pentagonal face, pug or thick nose, moderate body hair, fond of eating and drinking.

"He enjoys a good digestion, with a tendency to apoplexy and arteriosclerosis. On the mental side, he is predisposed to recurring, circular or manic-depressive forms of insanity such as melancholia. The pyknic is extroverted, easy going, tolerant in morals and religion and very often lovable because he claims no inside information in regard to the Almighty's designs."

The first few of the new scientific type-hunters measured everything in sight and even took X-rays. They did not know what was significant. Simplification has followed. Wertheimer of Johns Hopkins is now able to differentiate types by making only four simple measurements between skeletal points. These are combined into a formula as uncomplicated as one for finding the cubic contents of a box. For instance, John Doe's measurements when the formula is applied may give the end-total of 289. He is therefore an asthenic. Roe's index is 217, which shows him to be a pyknic. This measuring formula seeks to express the ratio between the mass or volume of the human frame and its length, the relation between its horizontals and its verticals. A low index means "full bodied"; a high index signifies "slender-bodied."

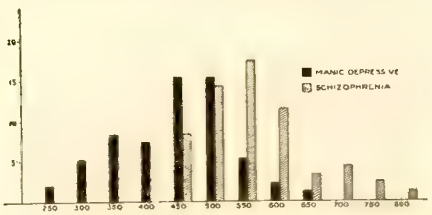
Disease tendencies of the two types differ markedly. Gall bladder disease afflicts the pyknic type almost exclusively. Asthenics "enjoy" a virtual monopoly of gastric ulcers.

Dr. Theophile Raphael of the Psychopathic Clinic, Detroit, took measurements in a number of institutions for the insane and discovered that pyknics as a rule are subject to cycloid (up in the skies and then down in the dumps) forms of insanity. The tall, thin asthenics seemed to be primarily susceptible to the brooding, fixed-idea, divided-personality forms.

Insects and dogs have been intensively studied and the same two forms—the long and the broad, have been found and correlated with the characters of the bugs or beasts—as the case may be.

Dr. E. Kretschmer, whose work *"Physique and Character"* is the classic on the subject (though American studies have cast doubt on some details in his conclusions), found the following traits outstanding among his cycloid, pyknic subjects:

1. Sociable, good-natured, friendly, genial.
2. Cheerful, humorous, jolly, hasty.
3. Quiet, calm, easily depressed, soft-hearted.




*The hospitals of Michigan measured their insane patients and found that body types and forms of insanity had a definite relation to each other. Stocky individuals are represented at the left; tall, slender ones at the right.*

All these three panels of personality belong to pyknics. Similarly, he attributes to his schizoid, asthenic patients the following related traits arranged according to their statistical frequency:

1. Unsociable, quiet, reserved, serious, humorless, eccentric.
2. Timid, shy with fine feelings, sensitive, nervous, excitable, fond of nature and books.
3. Pliable, kindly, honest, indifferent, dull-witted, silent.

These first conclusions are just an intimation of what's coming in the way of conclusions. The writer has talked with physical examiners of public school systems who have tabulated tens of thousands of cases, to men connected with public clinics who have been collecting facts but they are not yet ready to publish their findings. Just by a quick glance, these particular men can size up a subject, tell a woman, for example, at just what age she reached puberty, what type of ailments and mental problems beset her, and so on. It's as uncanny as fortune-telling, but based on the solid statistical basis of observation, classification, generalization. These men have to keep on measuring in preparation for proving their case. But for practical everyday diagnosis, they're getting so good they can place reliance on first impressions.


## $21,000.00 for Spirits

**For more than six years this publication has offered prizes totaling $21,000.00 for genuine demonstrations and proofs of spirit manifestations which we cannot duplicate by scientific and well-known means.**

**Up to the present time not one manifestation has been presented which by even the greatest stretch of the imagination could be considered genuine.**

**How many more years must this prize be offered? Spiritualists, please answer!**

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**"New hair came almost immediately** after I began using Kotalko," he writes, "and kept on growing. In a short time I had a splendid head of hair, which has been perfect ever since."

**This statement** by Mr. Wild is but one of many which voluntarily attest that Kotalko has stopped falling hair, eliminated dandruff or aided new, luxuriant hair growth where the roots were alive.

Hair roots that remain in the scalp long after the surface hairs are lost may regain their original power through proper encouragement. The process of hair growth depends on the hair roots and the nourishment they receive.

**Women** also report new hair growth through KOTALKO. Many testimonials from men and women whose health was undoubtedly good and whose hair roots were not dead.

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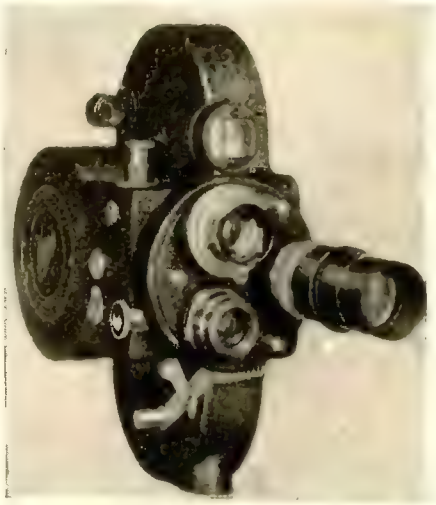
## Amateur Movie Camera with Visual Focusing Finder

VISUAL focusing through a focus finder is provided in a new model amateur movie camera, said to be the first on the market containing this equipment. It is a three lens turret instrument, and the lens to be used is turned to the finder position. You actually observe the same image which will be impressed on the film when the turret is turned to the photographing position. Three knobs on the turret front enable turning without touching the lens.



Courtesy Victor Animatograph Co.

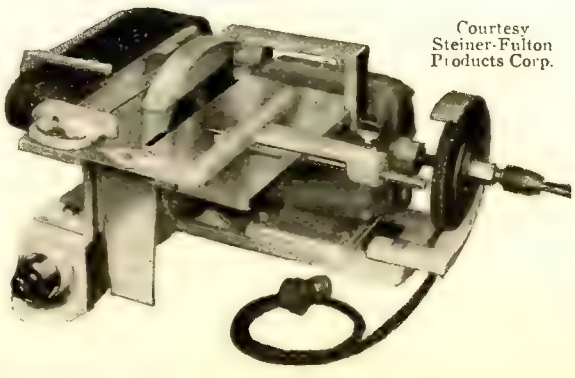
The finder is placed so that it can be used with the camera on a tripod at eye level as well as in the hand. Half normal speed, eight frames per second; normal, sixteen; for rapidly moving objects a higher speed, 24; 32 frames per second speed; and for slow motion, 72 frames per second are provided. Close-up objects can be focused accurately and very fast lenses used with this camera.

## A Compact Woodworking Outfit

THE Steiner Woodworker is a practical, economically-priced outfit for accomplishing any of a hundred jobs around the home. A universal table which is standard equipment facilitates cutting wood at any angle. By raising or lowering the table the handworker can cut grooves of any size or depth wanted. Rip gauge, miter gauge, and cut-off attachment are included in the saw equipment.

Opposite the saw is the belt sander for sanding strips or boards of any length. The belt sander is more efficient and accurate than a disc grinder.

A grinding wheel and drill chuck are driven directly by the shaft of the ¼-horsepower motor. Good design has made the woodworker a compact unit, and yet has placed each tool so that it may be used without interference from the others. The weight of the outfit is 75 pounds—sufficient to hold it in position during operation without the use of bolts or clamps.



Courtesy Steiner-Fulton Products Corp.

## Pocket Photometer

TO help eliminate guesswork in determining exposures a pocket meter has been put on the market. This photometer provides a full range of exposure readings from F1 to F32 and is said to accurately time those required to register shadows or dark details, highlights, outdoor or indoor objects. It can function with either artificial or natural light.

The meter is equipped with a small electric bulb whose incandescent filament is adjusted to match the brightness of the subject to be measured. This permits an instantaneous reading, taken from the dial of the lens diaphragm opening to be used. A dial controls the brightness of the filament.

One looks through the photometer and actually sees the object. A comparison is then made between the light intensity of any part of the subject and an incandescent filament in the instrument, whose brilliance is adjusted by a dial.

Courtesy Bell & Howell Co.

## A Universal Cement

A UNIVERSAL cement which will unite glass, metal or wood with each other or to any surface and which is waterproof can be easily made at home by dissolving in a very small quantity of creosote sufficient shellac so that the mixture, when cold, can just be dented with the finger nail. If a harder cement is required, it is made by using still more shellac until the mixture cannot be scratched with the finger nail when cold. To use the cement, the surfaces which are to be united must be heated and the heated cement applied in a very small quantity. Press the joints together and when cold, the material will be firmly joined together. Alcohol and alkalies will dissolve this cement. A thin film of this cement will hold better than a thick blob of it when correctly applied. When the surfaces are once in contact, the cement can harden. —*H. Bade.*

## Smooth Surface Wing

MANY model airplane builders have trouble in getting a smooth surface on a tissue-covered wing. To accomplish this merely pass it over the steaming spout of a kettle. This will shrink the paper and it will be drawn tight. Do not leave it over the steam too long as the strain may warp the wing.—*Burl Knutson.*

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Tubes: UX type, 30-day replacement guarantee, No. 210, $2.25; No. 250, $2.35; No. 281, $1.85; No. 245, $1.25; No. 224, $1.25; No. 227, 75c; No. 226, 65c; No. 171, 75c.

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# FORECAST

## *By the Official Forecaster*

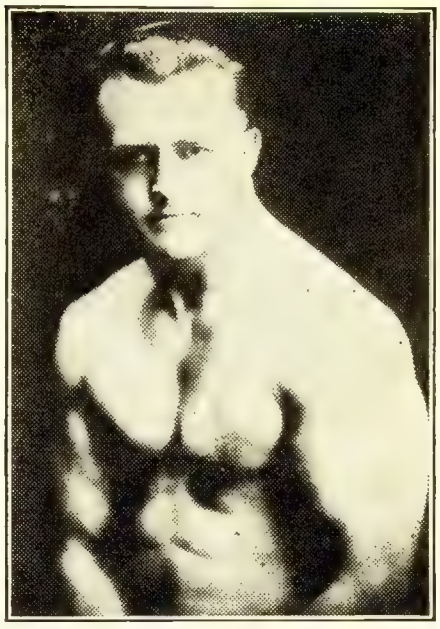
**WHAT to Do When Your Outboard Motor Balks** will be the subject of the first article of a series by **J. Phillips Dykes** to be published in S. & I. Lots of us are outboarding these days, and lots more of us are going to be as soon as there are enough motors made to supply our needs. This article of Mr. Dykes' hitches wonderfully with the season when outboards are most intensively and universally in use. And you will find that what Mr. Dykes tells you is grounded on outboard experience to the last word. He's a driver and a designer of such outstanding ability that the American Outboard Association has made him **Secretary and Rear-Commodore.** Out of 55 starts he has come home with 49 trophies. Last year he won first prize in all but a few races, and in these he crossed the line among the first three entries to finish. Repair, handling, design, power improvement, and all the wrinkles of outboarding will be covered by Mr. Dykes for S. & I. His articles comprise a feature we are extremely gratified at being able to offer our readers. We don't believe we could have found a better source of knowledge for the outboard field. . . . In addition we shall keep up with outboarding from the news angle. **Field Editor Joseph H. Kraus** will see to that.

SOMETHING quite different, but nonetheless in tune with the season, will be **Alma Chestnut's** exposé of **Sea Serpents,** those saltwater monsters which perennially affright ocean bathers and tourists. . . . Yes, and we believe that even inland waters are not immune.

SEASONABLE also will be a venture into meteorology in the form of an account of **The Padre of the Rains,** Father Ricard, who went far in connecting sunstorms with weather on earth, and made his forecasts so accurate that agriculturists came to swear by him.

**LIEUTENANT REYNOLDS and Herr Martin H. Schempp** will continue to tell gliding enthusiasts how to build the Scout Secondary Training Ship. Plans for this job will be available presently. Herr Schempp informed us recently that further improvements in the design had suggested themselves, and that he wished to incorporate them in the plans. . . . **Another constructor article** by Herr Schempp relating to the glider field is in prospect for the near future.

**HOW to Make It**—that class of articles which intensely attracts our handiworker readers—is slated to be served by constructor stories on subjects running from backyard merry-go-rounds to etchings, and including scroll saws, lamps, book shelves, garden furniture, and divers other interesting items. . . . **Chemistry, electricity,** and **physics** will continue to be featured. . . . **Radio** is going to be watched and accounted for by **Radio Editor George R. Brown.** . . . And, by the way, let no handiworker fail to get in on the **two new contests** announced on **Page 243** of the present S. & I. Here's a fine chance to show your how-to-make-it stuff — every month if you wish.

EARLE LIEDERMAN—***"The Muscle Builder"***
*Author of "Muscle Building," "Science of Wrestling," "Secrets of Strength," "Here's Health," etc.*

# Muscles 5c Apiece!

Wouldn't it be great if we could buy muscles by the bag—take them home and paste them on our shoulders? Then our rich friends with money to buy them, sure would be socking us all over the lots.

But they don't come that easy, fellows. If you want muscle you have to work for it. That's the reason why the lazy fellow never can hope to be strong. So if you're lazy and don't want to work—you had better quit right here. This talk was never meant for you.

## I Want Live Ones

I've been making big men out of little ones for over fifteen years. I've made pretty near as many strong men as Heinz has made pickles. My system never fails. That's why I guarantee my works to do the trick. That's why they gave me the name of "The Muscle Builder." I have the surest bet that you ever heard of.

## What I'm Going to Do

In just 30 days I'm going to increase your arm one full inch. Yes, and add two inches to your chest in the same length of time. But that's nothing. I've only started: get this—I'm going to put knobs of muscle on your shoulders like baseballs. I'm going to deepen your chest so that you will double your lung capacity. Each breath you take will flood every crevice of your pulmonary cavity with oxygen. This will load your blood with red corpuscles, shooting life and vitality throughout your entire system. I'm going to give you arms and legs like pillars. I'm going to work on every inner muscle as well, toning up your liver, your heart, etc. You'll have a snap to your step and a flash to your eye. You'll feel the real pep shooting up and down your old backbone. You'll stretch out your big brawny arms and crave for a chance to crush everything before you. You'll just bubble over with vim and animation.

Sounds pretty good, what? You can bet your old ukulele it's good. It's wonderful. And don't forget fellow—I'm not just promising all this—I **guarantee** it. Well, let's get busy, I want some action —so do you.

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**IN JULY**
***Radio News***

Twenty-four prominent men in the radio field give their opinions of the trends for the coming radio season.

Full constructional details for a Grid-dip oscillator especially useful in calibrating short-wave apparatus.

Three automobile-radio articles, one a pictorial showing the application of radio receivers to automobile use.

Practical Television. Four pages of photographs illustrating the various types of television receivers now available for home use.

Cascaded Output Systems for the Loftin-White direct-coupled audio channel.

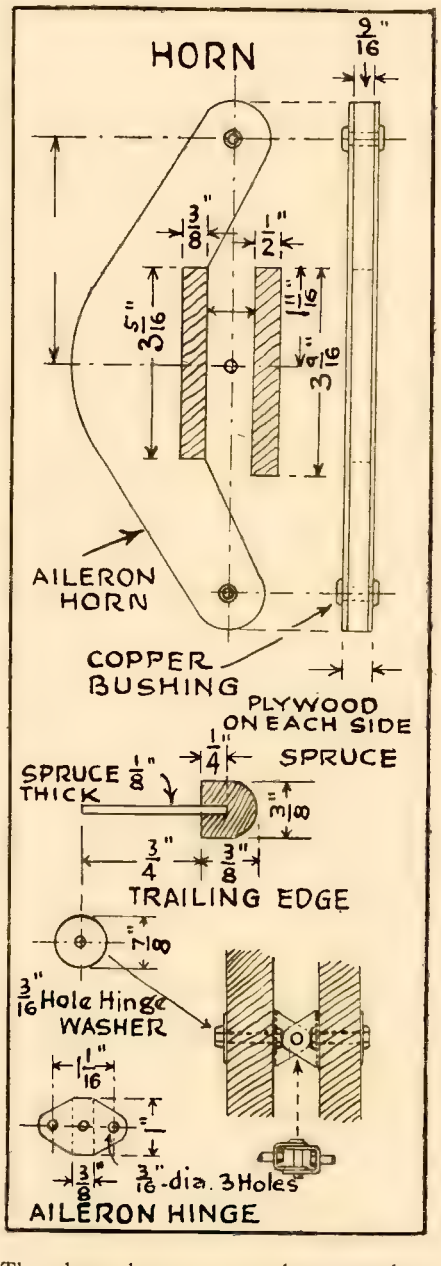
# How to Build a Scout Secondary Glider

By Lieut. H. A. Reynolds and Herr Martin H. Schemp

(*Continued from page 233*)

at least five minutes to prevent any lumps of undissolved glue being present. Caseine glue should be made fresh every day.

In the final assembly of the rib pieces, previously cut and fitted, a liberal amount of glue is applied to both sides and ends of each spruce strip at the junction points.



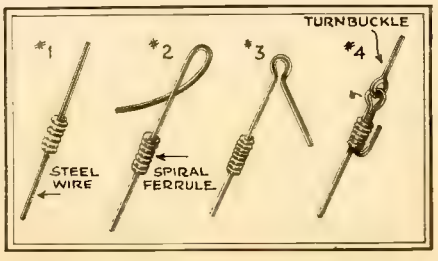

The plywood gussets are also covered on both sides with glue. After the rib has been glued and assembled in the jig 5/8"x21 ga. flat head brass nails are driven in to hold the gussets in place: Do not use more nails than necessary as they are apt to weaken the small wood strips. After all the joints have been nailed the rib is lifted out of the jig and hung up to air dry in a warm, dry room.

There are ten compression ribs built up as shown in the compression rib drawing. Two compression aileron ribs are also made so that the aileron spar opening will be provided for. This formation is shown in the aileron rib end drawing.

About 45 spruce strips 3/8"x5/8"x6' are needed to form the compression ribs. These strips should also be sanded to assist the gluing. The manner pursued in cutting and fitting the compression rib parts is practically the same as that employed in the regular rib construction. The plywood gussets are placed on the outside of the strips at each junction and are nailed with 3/8"x21 ga. flat head brass nails. These ribs are designed to withstand the compression of the wing bracing wires later when the wing frame is assembled. Provision should be made in each rib for the insertion of the 1/8"-thick flange of the trailing edge.

Four spars are cut 1/2"x3-9/16"x17'. They should be made of spruce and be clear of knots. The grain should run straight through their length and their selection and examination should be carefully made with this point in mind. These spars are called "main spars." Two spars are cut 3/8"x3-5/16"x6'-5-5/8". These spars are called "aileron spars." A 12"x3/4" taper is sawed off the top and bottom edges of all the spars at their tip ends. This is clearly shown in the drawings of the spars.

Assemble each wing individually. Take a front and a rear main spar and put pencil marks on them showing the exact position of each rib. Ship the ribs onto the spars and slide them along to their proper positions. Two compression ribs are placed at the butt end of the spars 7" apart and a compression rib is placed at every third station on out to the wing tip. The regular ribs are placed two between each of the compression ribs. The wing tip is a spruce strip 1/2"x1 1/4" glued between the spar tips. It is slightly rounded to present a round sided wing tip appearance. Be sure to have the aileron compression and regular ribs in their proper places. Make 16 double pull wire fittings of No. 14 carbon steel. Number 10 designates their construction and position in the wings. Make eight single pull wire fittings of No. 14 carbon steel. Number 11 designates their construction and position in the wings. 1/4" steel airplane bolts passed through holes bored in the spars hold these fittings in place. A steel washer is placed under the bolt nut on the opposite side of the spar. The nuts are permanently secured by heading or cutting the threads with a cold-chisel. Castled nuts and drilled bolts are ideal for this purpose as they can be safely secured and removed at any time for repairs. The aileron spar is next slid into place and measurements taken for the aileron hinges. The aileron hinges may be made from the drawing or if the builder desires he may purchase them ready to install from an airplane supply company. Six hinges are required and should be secured at this time to the back main spar and the aileron spar. One is placed




*Method of forming wire ends and fastening with spiral ferrules.*

AmericanRadioHistory.Com

LIST OF WING MATERIAL FOR MODERN TRAINING GLIDER

| Pieces | Name | Part No. | Material | Size | Length | Note |
|---|---|---|---|---|---|---|
| 4 | main spars | | spruce | ½x3-9/16 | 17' | carefully selected straight grain |
| 12 | regular ribs | | spruce | ⅜x⅜ | 5' | 1/16" plywood, gussets |
| 8 | regular aileron ribs | | spruce | ⅜x⅜ | 5' | 1/16" plywood, gussets |
| 10 | compression ribs | | spruce | ⅜x⅝ | 5' | 1/16" plywood, gussets |
| 2 | compression aileron ribs | | spruce | ⅜x⅝ | 5' | 1/16" plywood, gussets |
| 2 | strips for trailing edge | | spruce | ⅜x⅜ | 15' | 11" flange ⅛"x1" spruce |
| 2 | aileron spars | | spruce | ⅜x3-5/16 | 6'5⅝ | |
| 2 | wing tip strips | | spruce | ½x1¼ | 3' | one side rounded |
| 2 | aileron horns | | spruce | 9/16x4½ | 10" | sides covered with 1/16" plywood |
| 16 | double pull wire fittings | 10 | carbon steel | ⅝ | 3½" | No. 14 carbon steel thickness about 3/32" |
| 8 | single pull wire fittings | 11 | carbon steel | ⅝ | 1½" | No. 10 carbon steel thickness about ⅛" |
| 4 | wing brace flying wire clamps | 12 | carbon steel | | | No. 10 carbon steel thickness about ⅛" |
| | Fittings for Fuselage Attachment: | | | | | |
| 8 | spar clamps | 13 | carbon steel | | | No. 10 carbon steel thickness about ⅛" |
| 4 | spar brackets | 10 | carbon steel | | | No. 10 carbon steel thickness about ⅛" |
| 4 | pulley fittings | | carbon steel | | | No. 14 carbon steel thickness about 3/32" |
| 4 | pulleys | | aluminum | 4" | | |
| 28 | turnbuckles | | Nr. 322 SF | | | *Standard Airplane |
| 6 | aileron hinges | | steel | | | |
| 88 | bolts with nuts | | steel | ¼x1" | | |
| 8 | bolts with nuts | | steel | ½x1" | | |
| 2 | lbs. bracing wire | | piano wire | No. 30 | | not smaller than 1/16" |
| 60 | wire coils | | | | | |

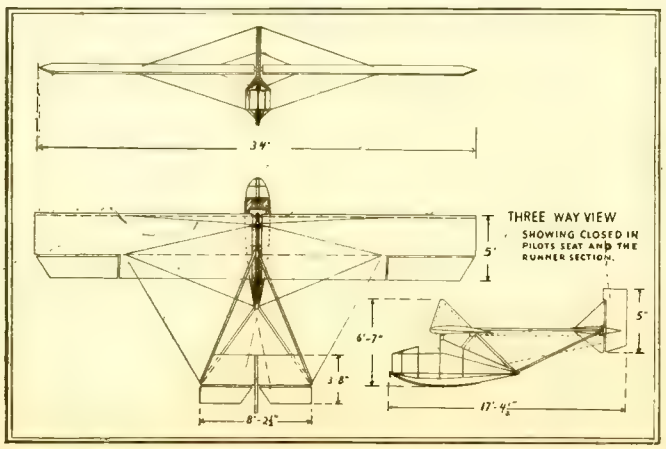
*Standard Airplane Turnbuckles can be purchased from Heath Airplane Company, 1721 Sedgwick Street, Chicago, Illinois.

in the center near the aileron horn position and one at each end of the aileron spar. They should be mounted in the center line of the spar to allow the maximum up and down movement of the aileron. Two aileron horns are made next of spruce with plywood sides glued on under compression. See the aileron horn drawing. Diagonal aileron bracing can be fitted next of ⅜"x⅜" spruce strips run in pairs, one on top and one on the bottom, just under the aileron ribs. They can be side braced by small plywood side gussets. A diagonal brace of this type is also fitted in the wing next to the aileron section. See the wing drawing. Make 4 wing brace flying wire clamps of No. 10 carbon steel. Number 12 designates their construction and position in the wing. These fittings are bolted to the spars with ¼" bolts and the metal straps fastening the flying wires are secured to the fitting with a ½" bolt which passes through the spar. The holes in these straps should be bushed with a copper bushing to form a bearing where the steel flying wires are secured to them. Make eight spar clamps of No. 10 carbon steel. Number 13 designates their position at the butt end of the spars and also the dimensions of their construction. ¼" bolts secure them in place on the spars and they should be drilled to receive a ½" bolt through the pointed protruding tip. Make four spar brackets of No. 12 carbon steel. Number 10 found with the spar clamp drawing shows their construction. They should be fitted to the spar clamps and drilled to be mounted with ¼" bolts. They can be laid aside until needed later, their construction at this time being convenient for fitting purposes.

Mount all the metal fittings to the spars and secure them permanently by setting each bolt nut so that it will not loosen. Each rib is next carefully glued to the spar in its correct position. Do not drive nails through the top and bottom long strips of the ribs as this weakens the rib. The best method is to shim the rib tightly to the spar by inserting small spruce pieces between the bottom edge of the spar and the bottom long strip of the rib. Use plenty of glue at these points and let them dry under the pressure of clamps.

Spruce strips of ⅜" size are glued and nailed along the top and bottom edges of the front spar between the ribs. This builds up the spar so that the cloth will not sag and present a bumpy appearance

(*Continued on page* 282)





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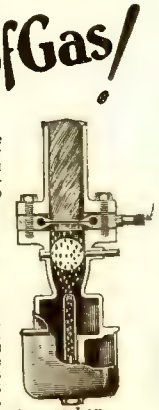

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# How to Make an Outboard Aquaplane

By Dick Cole

(*Continued from page* 231)

to two screw-eyes in the front cross-member.

The last operation is to bolt the transom-board in place. The bolts for the transom-board must be placed tightly in the stern board from the inside before the decking is put on.

The outboard motor is now clamped to the transom-board the same as to the stern of a boat. A whirl of the fly-wheel, and she's off. However, unlike with a boat, the aquaplane is not steered with the tiller. The tiller lever must be locked in place so that the motor drives straight ahead. Steering is done by shifting the bodily weight to tip the plane. When tilted to the left, the propeller is thrown to the right of the center line of drive, and the aquaplane turns to the left. And, in a same manner, to the right. Of course, an abrupt turn cannot be made, as with the tiller, but sufficient control can be had to meet ordinary conditions.

An aquaplane built to the foregoing specifications will be found very satisfactory when fitted with a moderate-powered outboard motor. But if a "giant twin" or "quad" is used, it is best to fit sheet metal step-plated to the stern board as shown in one of the drawings. The pattern and the manner of shaping these plates is shown in detail. Heavy galvanized iron or sheet brass can be used.

# Cross Word Puzzle

(*Continued from page* 269)

16. The sixth day of the week; an abbreviation.
17. Relating to or referring to; a word probably used more frequently in England than in the United States in correspondence and in law documents.
18. In England, a note on a bugle or hunting horn, also, a moat. In this country we are more apt to give it the French twist; "a witty saying."
20. To go without something, to dispense with.
25. A definite article, masculine, French.
27. An adverb denoting a state of lacking in moisture. We think we have improved on the British spelling of the word by substituting one vowel for another.
28. In England this word is often used as an adjective meaning "one." In addition to this use we more frequently use it as an indefinite article also meaning "one" or "any."
30. The symbol used by the British Lloyd's Register for the third class wooden and composite ships.
31. Fit; suited; well adapted.
32. Englishmen are accustomed to use this word where we would say "sick."
33. Saltpeter, also a medicine. In this case as in others of the same kind we have varied the British spelling by transposing two letters.
34. A spiced condiment for meats. The English spelling of the word differs widely from ours.
37. Abbreviation for Royal Highness; a purely British expression since we have no nobility in this country.
39. An adverb-preposition. It means toward the top, or aloft.
41. A conjunction. In the case that, or granting always, or supposing that.
43. In the United States this means, the top or head of anything. In England it means a heap or mound or a bank or a blow, or a lot more things.
44. A dull whitish tint. We think we have phonetically improved on the British spelling by substituting one vowel for another.
45. The "Rosy-fingered" Greek goddess of dawn.
47. A headdress worn by high ecclesiastics. Here, again, we have transposed two letters of the word which spelling we like better.
49. An exclamation.
52. An abbreviation for a British pound sterling. We have the same abbreviation, but it doesn't refer to money.
54. To yield or sink downwards.
55. Small, tiny, a short space of time.
56. A prefix in some compound words.
58. Four hundred and thirty years ago. Use Roman numerals.
60. The era in which we live. The abbreviation has almost become a word of itself.
61. An English suffix attached to verbs to form nouns of agent.

*See Solution on page* 281


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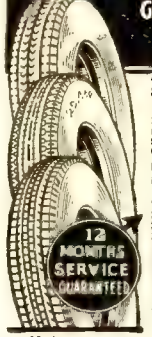


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| 33x4 | 2.95 | 1.15 |
| 34x4 | 3.50 | 1.15 |
| 32x4½ | 3.20 | 1.45 |
| 33x4½ | 3.20 | 1.45 |
| 34x4½ | 3.45 | 1.45 |
| 30x6 | 3.60 | 1.75 |
| 33x6 | 3.60 | 1.75 |
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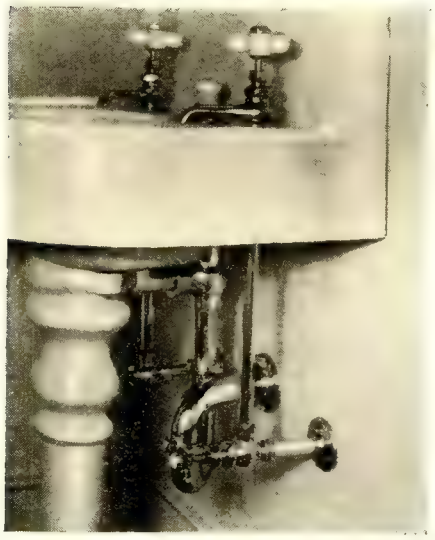
# Bathrooms a La Mode

## By S. Gordon Taylor

(*Continued from page 217*)

additional bathroom facilities the owner of an existing home may give some thought to modernizing his present bathroom. The present-day type of plumbing is neat in appearance and quiet in operation, and in some modern bathrooms the flush-box, for instance, has been eliminated entirely and the required flushing flow is supplied by the normal water supply pressure. The old clawfoot bathtub is a thing of the past, for the modern tub extends to the floor and is built into the walls so there is no place for dirt and moisture to accumulate.

The outlets of basins are no longer equipped with the old bothersome chain and stopper, nor is there any necessity for a miscellaneous assortment of glass-holders, soap-holders and other accessories to be fastened to the walls. Space is now provided in a medicine chest for most toilet articles. Soap-holders and other such fittings are built into the walls.



Courtesy Chromium Corporation

*Permanent lustre chromium plated metal work prevents pipes and other metal bathroom fittings from tarnishing.*

Modern faucets do not require new washers every few months and have been generally improved in mechanical operation, as well as in appearance. In general, fittings are available in plated metal, china and solid metal. China and nickel plate have, of course, been popular for years. Then came chromium plate with its high lustre which lasts indefinitely without laborious cleaning and polishing. Finally, there are now available fittings made from a solid white metal which maintain their original finish for all time, and have no plating to chip, peel or wear off.

Shower baths are being employed almost universally in modern bathrooms. If the shower is to be installed over the bathtub, it can well be of the type which throws a stream from the side rather than from directly overhead and should include a control which permits the shower to be turned off and on without having to readjust the temperature with each operation. Many home owners consider it a convenience to have the shower in a separate shower compartment. These compartments may be built-in with walls of tile and a glass door or curtain; or may be all glass.

Not the least advantage offered by modern plumbing fixtures lies in the fact that they are available in various attractive colors. Bathtubs, lavatories, wall tile and floor can all be fitted into any desired color scheme. Such colored fixtures, in addition to their greater attractiveness, are easier to keep clean.

Various types of tile are used for both walls and floors. There are the ceramic tiles which are available in such a fascinating variety of colors and textures that they will meet any decorative requirements. In addition to the ceramic tiles, there are other materials which have many of the advantages of ceramic tiles but usually at a lower cost. Rubber tile, for instance, makes an excellent flooring which, when properly laid, is impervious to water and is somewhat more comfortable under-foot than stone-like ceramics. Linoleum is another material of high merit, and there are others of different compositions which are popular.

In modernizing old bathrooms or in providing new bathrooms in old houses, there are several practical types of wall covering which are readily and economically installed. If the work is to be done by the home owner, he can use one of the types, that come in sheet-tile form. One kind has a metal backing and enamelled surface; another is of composition asbestos and cement; another is of a very light-weight fibrous composition material; all are made in various colors and finished to imitate ceramic tile.

Brass pipe is now being extensively used, especially when the local water is known to attack iron or steel pipes. Even in the less expensive homes costing $5,000 or $6,000 it is popular. While the cost of such pipe is somewhat higher, it is considered well worth-while, because of the better service rendered and the elimination of maintenance expense.

The supply pipe should be sufficiently large in size to provide adequate flow at all times and the lines to individual fixtures and to different floors should be carefully selected according to the number of outlets they supply. It is extremely annoying to one in an upstairs bathroom to have the water supply practically cut off when a faucet is opened downstairs. This is especially true and may even be dangerous in the case of a shower where the

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*Clips nailed to the plaster wall make possible ready installation of asbestos composition wall tile.*

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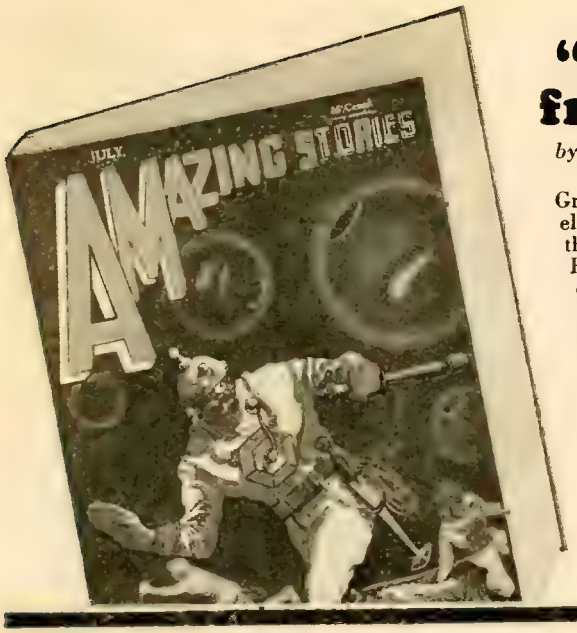


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water suddenly becomes scalding hot when the opening of a cold water faucet downstairs cuts off the cold water supply to the shower. Such are the results of employing undersize pipes.

The primary purpose of the traps in waste pipes is to form a water seal to prevent sewage gases from coming back into the room through the waste outlets. If it were not for the vent pipe in the waste line system there would be a syphon action which would draw all of the water out of the traps thereby breaking the water seal. With the free circulation of air provided by the vent pipe this syphon action is impossible.

In laying out the plumbing system in a house or in remodeling it for additional equipment, the pipe systems, both supply and waste, should be considered as a whole. If two bathrooms are to be installed upstairs, for instance, it is advisable to keep them as close together as possible in order to secure the minimum amount of piping. Drain pipes, inasmuch as they do not operate under pressure must be inclined. If several pieces of plumbing equipment are grouped close together they can all feed into one drain pipe running into the basement. But if two bathrooms are widely separated on an upper floor they will have to be provided with individual drain pipes because the floor thickness is not sufficient to permit adequate slope for long runs of waste pipe. Where it is possible it is well to have upstairs bathrooms installed over the kitchen in order to permit a single set of risers to serve both the bathrooms and the kitchen.

Courtesy Upson Co.

*Composition sheet tile comes in various colors and is as easy to install as wall board.*

And there is no reason why all of the work except the plumbing should not be done by the home owner. Many modern floor and wall treatment materials do not require unusual skill to install and a considerable saving in this work can be made through the elimination of tile setters, carpenters and painters. If ceramic tiles are used, the tile setter will of course, be well nigh indispensable and there is no questioning the attractiveness and durability of ceramic tile for bathroom floors and walls.

In so many cases the cost is a governing factor that the consideration of substitute materials in place of real ceramics offers a fortunate opportunity for obtaining attractive, durable finishes at comparatively low expense.

The home owner who has not kept in touch with modern developments in bathroom equipment and finishes will do well to pay a visit to the showrooms of local plumbers or plumbing supply houses. Many of these have demonstration bathrooms which will furnish inspiration to one who is planning on building a new bathroom or

(*Continued on page* 282)

AmericanRadioHistory.Com

# Sailing Craft of the Air

By Augustus Post

(*Continued from page 212*)

Everyone has heard of the gliders built by Hawley Bowlus. Colonel Lindbergh's experiments with the Bowlus gliders have assured that. The Bowlus Sailplane incorporates the best features of the latest German types, with a high tapered wing and full cantilever construction. Its gliding ratio is about twenty to one. The fuselage is of rectangular cross-section, tapering to a horizontal wedge in front. It is sold at about $800.00.

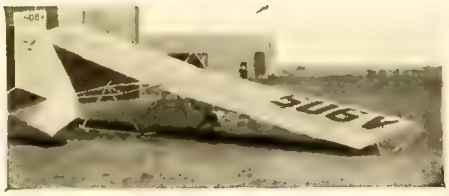
The Condor, a soaring ship developed and made by the Baker-McMillen Company of Akron, Ohio, has distinguished itself in towed flights behind one of the well-known Goodyear Company's blimps, with Dr. Wolfgang Klemperer at the stick. The Condor is a ship of notably clean design, with the tapered wings and cantilever construction characteristic of the most successful soaring ships. The price is $650.00, plus crating, at Akron.

*A wide-winged soaring bullet is this Condor. Dr. Wolfgang Klemperer in the cockpit.*

Hydro-gliders are certain to play a part in water sports this year. Gliders, Inc., of Orion, Michigan, has developed a successful ship of this kind which has been flown by Captain Frank Hawks and others. Its understructure is of the pontoon type, and it has flown at thirty miles an hour in tow behind a motor boat. Other hydro-gliders are being built by Air Associates, of Long Island, and the Motorless Aviation Corporation.

*This flying-boat hydro-glider was built by the Motorless Aviation Corporation.*

The Evans all-steel primary training glider is sold in knockdown form. Complete parts are furnished, cut and fitted, with instructions for assembly. Bolts simplify the work of assembling. The price is $247.50 at Los Angeles.



*Alexander Aircraft of Colorado Springs offers this trim primary ship.*

The Mattley Trainer is declared to be an improvement over the original Zoegling glider and is endorsed by technical experts who are members of the National Glider Association. It has a wing spread of 33 feet. The wings are of airplane spruce frames covered with fabric and coated with Fuller dope. It is priced at $575.00, f.o.b. San Francisco.

*Glenn Curtiss made his hydro-glider flights in 1922 by the towed method.*

## Solution to Cross-Word Puzzle on page 269

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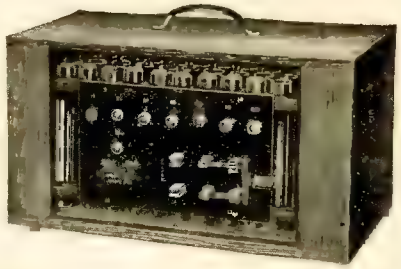

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## Bathrooms à la Mode

(*Continued from page* 280)

revamping an existing bathroom. Also, many manufacturers have booklets available, copiously illustrated in color. These may be had for the asking. A number of them are listed in the manufacturers' booklet directory which appears in the April, May and June issues of SCIENCE AND INVENTION. Any booklets will be sent to you upon request. Please use box under list and order by number.

## Awards in Basement Plan Contest

**Announcement of the winning plans in the Basement Improvement Contest will be made in the September number of SCIENCE AND INVENTION. . . . Especially satisfying has been the high interest evinced by our readers in home improvement, not only with respect to the basement, but to every part of the home. . . . In this connection we shall be glad to take care of further requests for the helpful Home Service booklets listed in SCIENCE AND INVENTION for April, May and June.**

## How to Build a Scout Secondary Glider

(*Continued from page* 277)

between the ribs and spar edges. Do not attach these strips on the edges of the rear spar.

A 7" wide strip of plywood is next glued over the surface of the two compression ribs at the butt end of the wing. This plywood can be very thin (1/32" plywood) and is wrapped around the leading edge of these ribs, being glued and nailed into place, and continues to the trailing edge on the top and bottom surfaces of the wing. See wing drawing.

A 4" wide strip of thin plywood is glued and nailed to the top and bottom surfaces at the wing tip. This plywood runs from the front spar to the back spar and is fastened to the spruce strip at the wing tip. After the glue is dry the wing tip can be sanded to make a smooth rounded job of the wing tip edge.

The trailing edge should next be constructed. A 3/8"x3/8" spruce strip can be rounded on one side either by hand planing or by machine shaper. A 1/8"x1/4" saw groove is cut along the center of its square side opposite the rounded side. A 1"x1/8" spruce strip is next glued into this groove. If possible this trailing edge should be made long enough to extend all along the trailing edge of the entire wing. See the crosssection drawing of the trailing edge. In mounting the trailing edge to the wing simply apply glue between the rib strip ends and insert the 1/8" thick flange of the trailing edge between them. These connections should be clamped tight and allowed to dry. The trailing edge can later be sawed away at the junction to the wing.

***The building of the wing framework will be concluded in the August* SCIENCE AND INVENTION, *and the fuselage and tail section will be taken up.***

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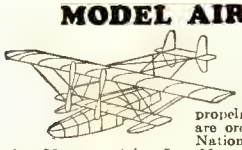

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County of NEW YORK }

Before me, a notary in and for the State and County aforesaid, personally appeared Arthur H. Lynch who, having been duly sworn according to law, deposes and says that he is the Editor of Science and Invention, and that the following is, to the best of his knowledge and belief, a true statement of ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24th, 1912, embodied in Section 443, Postal Laws and Regulations, to wit: 1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Experimenter Publications, Inc., 381 Fourth Ave., New York City; Editor, Arthur H. Lynch, 381 Fourth Ave., New York City; Managing Editor, Murray Godwin, 381 Fourth Ave., New York City; Business Manager, H. K. Fly, 381 Fourth Ave., New York City. 2. That the owner is: Experimenter Publications, Inc., 381 Fourth Ave., New York City, B. A. Mackinnon, H. K. Fly. 3. That the known bondholders, mortgagees and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None. 4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him. 5. That the average number of copies of each issue of this publication sold or distributed through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is (This information is required from daily publications only.) Signed, Arthur H. Lynch, Editor. Sworn to and subscribed before me this 17th day of March, 1930. (Seal) Joseph H. Kraus. Notary Public, City of New York. (My commission expires March 30, 1931.)


# Safe Thrills for a Great Talkie

By Edwin Schallert

(*Continued from page* 208)

match. He is at the top of a ladder. Surprised he loses his balance, and the ladder topples over. The match goes out and the room is pitch-dark again. Lloyd was safeguarded with a pair of shoulder-strap supports attached to a beam above (Fig. 5). These left him hanging when the ladder fell.

The leaping dragon is depicted in Figure 3. This unearthly chimera emerges with terrific force from the door which Lloyd and Clancy open in trying to get out of the den. A catapult was employed to shoot it out in this fashion—a spring behind a long rod which drove the dragon out with the leaping force (Fig. 4). Head and body of the dragon were of very light papier-mache and cloth construction, respectively.

In scenes like the one where Lloyd is shown battering the Chinamen over the head fibre wood clubs were used—very light and soft. They gave the necessary resounding thwack sound, but injured no one. Those struck grunted as they fell to produce a realistic effect. (Fig. 6)

At the end of the picture Lloyd rides away with his girl on a motorcycle, tearing wildly along on one wheel. Here stunt riders substituted for the star and the girl. The motorcycle runs into a bad road, and upsets. When the hero and his fiancée come to again it is in front of a signboard advertising coffee of a "heavenly" flavor. Because of the sign they believe they are in another world.

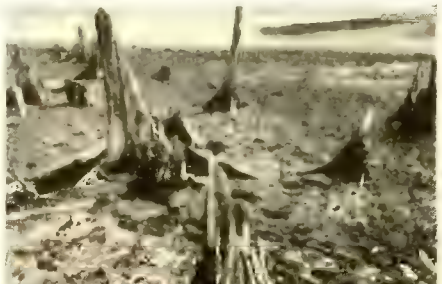
The camera "cuts away" from the upset to this close-up shot so that Lloyd and his leading woman can exchange places with the two stunt riders.

# The Sea Coast Is Sinking

By H. J. Lutz

(*Continued from page* 220)

William Sound, the writer, was surprised to find tree stumps and even dead trees standing well out beyond the present high-tide line. At low-tide one encounters a veritable forest of tree stumps in some of the bays of this island. Noting a peculiar sponginess of the beach in one place he made an examination which disclosed an interesting condition. For a distance of over 100 feet out from the present high-tide line, it was found that the shallow beach gravel was underlain with a deep desposit of peat. Clearly the sea coast is subsiding here, and with the luxuriant forest growth it supports is slowly being buried beneath the cold waters of the North Pacific.



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# Scientific Book Reviews

MODERN COSMOLOGIES, by Hector MacPherson. Oxford University Press, London, England, 131 pages. Price $2.75.

This little work from the Oxford University Press gives a very interesting account of the different theories of the world of stars and planets, in other words, of the theory of astronomy. In the beginning, a very interesting resumé in the shape of an introduction, treats of the old-time philosophers and then, coming down to the day of Ptolemy, the text is carried right through its successive stages of development to the 20th century, and the final chapters treat of the nebulae, the galaxy and of the very last developments. There is an astonishing amount of matter contained within the few pages, and it is so presented as to make excellent reading. Naturally the author cannot forego alluding to the myth of Galileo. An adequate index closes the book.

WAVE MECHANICS, by H. T. Flint, Ph.D., IX, 117 pages, $1.25. THE CONDUCTION OF ELECTRICITY THROUGH GASES, by K. G. Emeleus, M.A., Ph.D., X, 94 pages, $1.10. MAGNETISM, by Edmund C. Stone, Ph.D., VII, 117 pages, $1.10. All published by E. P. Dutton & Co., Inc., New York City.

These are three manuals of an interesting series published by Dutton. They are very small, running in the neighborhood of 100 pages each, but by remorseless use of the higher mathematics, at least in two of them, they are made to cover a great deal of ground. The publishers consider them as belonging to a series of highly specialized monographs and that certainly expresses exactly what they are. If one wants to know how much or rather how little he knows about the calculus and modern mathematics, we would respectfully refer him to Wave Mechanics. The books are well indexed.

PRACTICAL RADIO CONSTRUCTION AND REPAIRING, by James A. Moyer and John F. Wostrel. Published by McGraw Hill Co., New York City. Price $2.50.

This is the second edition of a book originally published in 1926. It contains much new data concerning the construction of A. C. operated sets, and servicing of them. It takes up systematically the theory and actual practices of radio from the antenna and ground system through the construction of sets to servicing. It contains chapters on the construction of neutrodyne, regenerative, super-heterodyne and tuned radio frequency receivers. It also gives complete details for making audio amplifiers, loud speakers, and eliminators and chargers. Its chapters on trouble shooting and repairing are especially pertinent to the radio fan.

THE SIZE OF THE UNIVERSE, by Ludwik Silberstein, Ph.D. Published by Oxford University Press; VIII, 215 pages. Price $3.50.

This book is one of the first attempts to explain the mathematical formulae behind Einstein's various theories. It is especially devoted to the determination of the invariant curvature radius of spacetime. It contains such chapters as the calculus of tensors, projective space, Einstein's cosmology, Hubble's results, the Doppler effect, and a multitude of many other chapters dealing with abstract formulae of astronomical theories. This book may hardly be called within the scope of the average layman.

THE BIOLOGICAL BASIS OF HUMAN NATURE, by H. S. Jennings; XVIII; 384 pages, published by W. W. Norton & Co., Inc., New York. $4.00.

From his years of research and experiment as Henry Walters, Professor of Zoology and Director of the Zoological Laboratory in Johns Hopkins University, Professor Jennings has written a very scholarly and still interesting book on genetics and experimental embryology as they affect man and his problems today.

The origin, development and nature of traits that distinguish human beings, and which in man make up character receive careful analysis; many questions which have arisen concerning the relative importance of heredity and environment, the progress or retrogression of marriage as an institution and the reason for its being, how changes come about in inherited constitution are all answered satisfactorily, or as satisfactorily as can be expected at this time.

Of course, certain chapters will appeal to you more than others—particularly good are those on Race Mixture and Its Consequences, Diverse Doctrines of Evolution, and What Can We Hope from Eugenics. Conservative and sane exposition is the keynote of the book, which is quite deserving of Scientific Book of the Month Club's choice.

THE A B C OF TELEVISION, OR SEEING BY RADIO, by Raymond Francis Yates. Stiff cloth covers, 9" x 6". Price, $3.00. Published by Norman W. Henley Co., New York City.

This book is a rather interesting and informative one for anyone interested in this new phase of the radio science. The author discusses everything in television, from its inception to the present time. Such chapter heads as "Television Systems," "Photo-Electric Cells," "The Problem of Scanning," and "How to Make a Television Receiver" give some idea of the completeness of this book.

FORD MODEL "A" CAR, by Victor W. Pagé. Published by Norman W. Henley Co., XIII, 545 pages. Price $2.00.

The author of this book is completely familiar with the construction and operation of the Ford cars. In order to obtain many of the facts concerning this very popular car, Mr. Pagé made many trips to Ford factories to obtain photos which would illustrate clearly those portions of a car which are not easily described to the layman. It is our opinion that even the rankest beginner will be able to understand, from this book, enough about his car to make those simple repairs which are ofttimes essential. The book deals very completely with every portion of the car, from the theory of the four-cylinder engine to the repairing of the differential.

STORAGE BATTERIES, by George Wood Vinal. Published by John Wiley & Sons, X, 427 pages. Price $5.00.

This is the second edition of a book originally published in 1924, and is considered one of the foremost authorities on the subject of storage batteries. It contains much impressive data about various electrolytes, various types of batteries, specific gravity tables, factors determining the capacity of batteries, methods of shipment for various electrolytes, dismantling and assembling the various batteries, factors which affect the efficient operation of batteries, and many facts concerning sources of trouble in battery operation.


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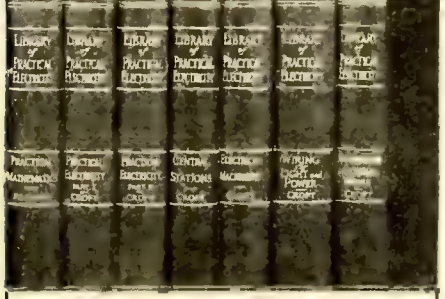

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*(While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.)*

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# How Old Am I Financially?

By Alfred M. Caddell, *Financial Editor*

THE above title is the name of a book which has recently been published by the American Provident Society, 51 Madison Ave., New York City, and which has taken bankers, business men and countless individuals by the eyes and made them see things financially aright. Briefly, the book makes one think of financial habits, and of course its purpose is to point out the best of those habits. Its author, Charles M. deForest, brother of Lee deForest, radio inventor, has written a most powerful book on getting started right. He believes that if he can succeed in doing this the habits thus formed will take care of the future of any man, woman or child.

Another title of this article might have been: "Making Financial Habits Work for You," and still another, "Making Your Money Earn Your Living for You."

A short time ago the writer received a letter from a man in Alabama asking how he could participate in the apparently new (to him) arrangement whereby money invested would yield an income sufficient for him to live on. "How much money would it take to yield me, say, $4,000 a year income?" he asked. And then this startler: "Where can I borrow the money for such an investment?" Of course, he was informed that the interest he would have to pay for the loan of the money would unquestionably offset any dividend that he could hope to have from a comparatively safe investment-yield, even provided that he could borrow 100% of the purchase money in the first place—which he could not.

It is not to such people, who harbor the thought of raising themselves by their own bootstraps, that this article is addressed; rather, it is the writer's desire to present the viewpoint of a man (or woman) making today's labor help take care of the tomorrow and not simply keep him or her alive, so that one might labor another day. For the average man there is only a single way to achieve financial success, and that is by intelligent saving, the savings to be invested in sound securities that will yield upwards of six per cent. If he starts intelligent saving before the opposite kind of habit engulfs him, each of his dollars will present him with six and possibly more healthy children every year long after he "has lain down the pick and the hoe." And then after he has accumulated a financial reserve he may take more speculative chances with part of his money. But the main thing, practically every banker or financially successful man will tell you, is to sow the seed of the savings habit, cultivate it assiduously and then watch it grow into a tree that will yield abundant fruit.

"A wise man can make money write his declaration of independence and back it up as with an army," says Mr. deForest.

Saving money is, to most people, a good deal like getting up in the morning—it is something that is put off as long as possible. Some people require the gentle stimulus of an alarm clock and then, the habit of getting up once formed, they get up about their usual time naturally. The habit thus acquired works incalculable benefits for them.

The compound interest tables to be found in Mr. deForest's book provide an interesting education in themselves. For instance, money invested at 5½%, which is very conservative, doubles in 12.78 years, quadruples in 25.56 years and multiplies 12 4/5 times in the 47 years ranging from 17 to 65, the earning period of an average man.

"Nine-tenths of wisdom is being wise in time," said Theodore Roosevelt. The experience of the world dictates that the time to lay the foundations for strength, character and the independence in life, which all men crave, is as early in life as possible. As wise old Ben Franklin said: "Poverty often deprives a man of all spirit and virtue. It is hard for an empty bag to stand upright."

Volumes could be written about "How Old Am I Financially?" but the key to the query is to be found in intelligent saving and intelligent budget. A budgeting system makes a man ask himself: "What value am I building up per dollar expended?" That leads to discrimination in spending and that's a never-to-be-forgotten signpost on the path of life.

Of outstanding interest and value to most people are the reserve schedules and financial records which Mr. deForest has developed. In their own mute but comprehensive way they say: "Here is the key to success—take it."

To what we may ask did Shakespeare refer when he wrote:

There is a tide in the affairs of men
Which, taken at the flood, leads on to fortune;
Omitted, all the voyage of their life
Is bound in shallows and in miseries.

For most of us, the tide comes flooding in during the early years of earning. It must be "taken" by habits of saving. Each one of us can afford to ask himself: "How Old Am I Financially?" for therein lies the answer to most of our hopes and joys.

## Questions and Answers

**Conducted by Alfred M. Caddell**

**Information on securities will be furnished readers of "SCIENCE AND INVENTION" free of charge by mail and through these columns. A 2-cent stamped, self-addressed envelope should be included in your letter. Address your inquiries to the Financial Editor, SCIENCE AND INVENTION, 381 Fourth Ave., New York City.**

Question—I have some U. S. Smelting & Refining stock. It has not progressed lately. Would you advise holding? A. M. R., Madison, Wis.

Answer—U. S. Smelting & Refining, selling at this writing around 30, appears to be a good investment-speculation. Stock pays $3.50 dividend, which makes it close to 12%. Company has book value of better than $88 per share. Nothwithstanding the slump in copper prices, the copper industry is scarcely going out of business. In fact, most things have to go down before they can go up, and I believe that you will see the copper and affiliated company shares reach a new high level for all time before many months. How soon no one of course knows, but that is the very nature of things.

Question—What is the status of Schulte Retail Stores? I own some stock at 52 and it is now down to 9½. R. L. O., Concord, N. H.

Answer—Schulte, in common with other cigar-store stocks, has felt the brunt of the cigarette price-cutting war very severely, and the earnings naturally reflect this. In addition, internal dissension has been reported, and this sometimes causes havoc in management. No one can say when such conditions will clear up and I, for one, would not care to hazard a guess, for a guess it would be.

Question—Do you consider real estate securities good for investment? L. R. C., Camden, N. J.

Answer—Yes, decidely so. If intelligently placed, real estate securities in the unit ownership form or in straight ownership have an enviable record for proving good. Of course, such securities do not enjoy as liquid a market as units of ownership (stock) in industrials, railroads and other types of securities which are bought and sold in the public markets, but they have answered the income problem for many people over long terms of years and undoubtedly will continue to do so.

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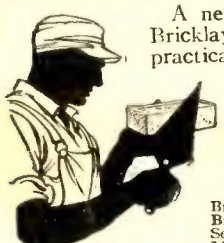

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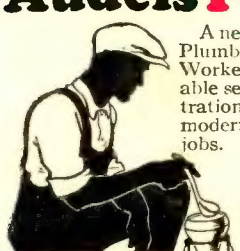

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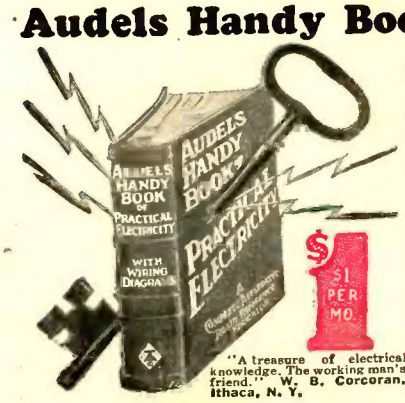

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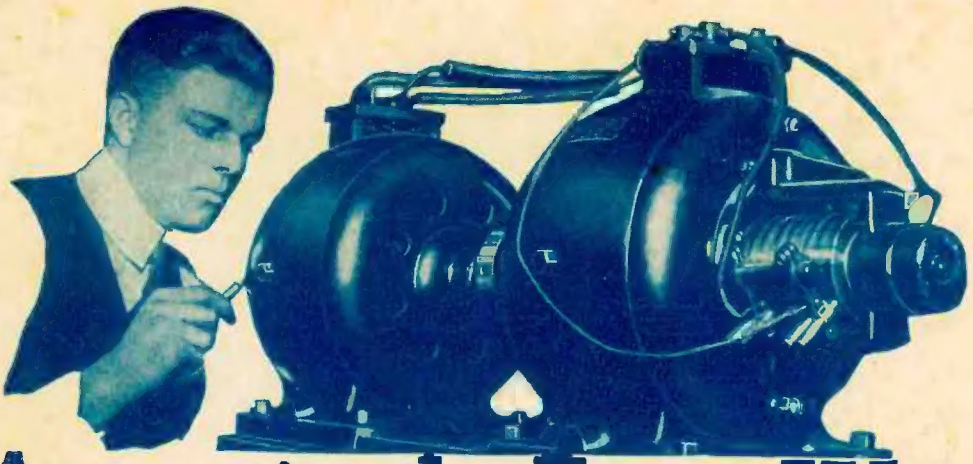

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